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A 4-year research project developed a preschool program for exceptional children unable to attend public school but not needing to be institutionalized on the basis of empirical behavioral principles. Children were referred from agencies and most had already unsuccessfully used special school services. The average age was 5-5 years, average IQ was 83, and average mental age 4-3 years; scores on the Wide Range Achievement Test averaged early kindergarten level. Utilizing special features in the physical plant, curriculum, and operation of the school, behavioral principles were applied to weaken behaviors interfering with academic learning and to strengthen desirable social and intellectual behaviors. Reading, writing, and arithmetic programs were developed as well as procedures for maintaining motivation for learning. Specific techniques were applied to modify the behavior of aggressive, shy, and speech deficient children. Investigators worked with parents at home, and the parents supplemented the nursery program. Objectives and procedures of a teacher training program are specified; a bibliography with 23 entries, a list of 10 publications resulting from this research, samples of program studies from the first 2 years, case studies, and eight figures are included. (Author/SN)

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RESEARCH IN REMEDIAL GUIDANCE OF YOUNG RETARDED CHILDREN WITH BEHAVIOR PROBLEMS WHICH INTERFERE WITH ACADEMIC LEARNING AND ADJUSTMENT

Research in the Preschool Education of Retarded Children with Behavior Problems: Application of Behavioral Principles to a Program in Prevention

Sidney W. Bijou

University of Illinois

Urbana, Illinois

June 1968

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Summary

This report is a description of research conducted during the past four years (1964-68). The objective of the study was the construction of a well-balanced preschool program through research and development based on empirical behavioral principles. The program, intended for exceptional children, is preventive in nature in the sense that it attempts to arrest or slow down retardation in marginal children, marginal in the sense that they are too retarded or disturbed to attend school but not sufficiently deviant to require institutional residential care. Investigations carried out with mildly and severely retarded and disturbed youngsters have shown that empirical behavioral principles can be applied to the formulation of a technology of nursery school guidance and psychotherapy. These studies provided background information for the undertaking described here.

According to empirical behavioral principles, the child, the environment, and the interactions between them are conceptualized in objective terms. The interactions refer to reflex (respondent) and operant conditioning, generalization, discrimination, abstraction, conceptualization, chaining, extinction, setting conditions such as satiation-deprivation, and the like. These principles have been derived mostly from laboratory studies extending over many years. According to this approach the retarded child with problems is one who is handicapped because of a history of particular biological, physical, or social conditions and interactions.

The research strategy in this investigation is representative of research and development. Principles derived from the laboratory are applied directly to the complex situations involving preschool education, parent counseling, and teacher training. Research is first intra-systematic, which means that an individual child is studied experimentally in a one-to-one situation in the natural setting of the school or clinic. When empirical findings are demonstrated, they are duplicated on other children and then incorporated into the teaching practices. Gradually a special preschool educational technology is constructed. Research is then inter-systematic, i.e., group comparisons are made between these approaches that have been developed and others.

The children studied are enrolled in a special nursery school. The physical plant, curriculum, and operation of the school are described in some detail. There are explanations as to how the principles are applied in order to weaken behaviors that interfere with academic learning, and to strengthen desirable social, intellectual, preacademic, and academic behaviors. Behavior modification and programming principles are explicitly used in every activity

during the entire school day.

The reading, writing, and arithmetic programs developed for the program are described. Also discussed in this context are the procedures for obtaining and maintaining high motivation for academic learning and for shaping appropriate attending behaviors and study habits.

The research on behavior modification is also presented, with emphasis on the rationale and methodology. Examples of research in changing personal and social behavior are given for the aggressive child, the shy or behaviorally deficient child, and the speech deficient child.

Research with parents of the children enrolled in the program is aimed at determining how the parent can support and supplement the program developed for her child in the nursery school. The procedures involve observation and analysis of the parent in actual relationships with her child. Examples of the methodology and findings from several investigations in the home are given. Direct situational counseling is a natural inference from this line of investigation.

Finally, an account is given of the application of principles to training the teachers who serve in the program. The principles applied are basically the same as those used to modify a child's social behavior or to improve his performance in arts, crafts, and academic skills. The terminal behaviors, steps in the program, and contingencies are different, as there is more stress on verbal skills and repertories. The aim of the training is to prepare teachers to set up terminal behaviors for the children, to work out details of their programs and alter them as needed, to assess and manage contingencies to train assistants, and to work with the parent, all within the frame of reference of an analysis of behavior technology of special education.

1. Introduction

The dearth of effective special school programs for mentally retarded, behaviorally disturbed children has in recent years become a major concern. It is true that some special educational facilities do exist, but they are designed primarily for middle childhood children. The relatively few school programs devoted to preschool age children are in the early phase of development; the concensus is that there is need for many more (Kirk, 1958; Morse, Cutler, and Fink, 1964; and Arrill and Braun, 1965).

It is generally accepted that the preschool curriculum for exceptional children should be similar to that of the regular nursery and kindergarten programs. Activities emphasizing social living, oral communication, and self-help skills are suggested (Dunn, 1964). Surveys reveal a wide diversity of rationales for particular programs, most of which seem to be based on intuition rather than on the application of psychological principles (Morse, Cutler, and Fink, 1964; and Arrill and Braun, 1965).

The objective of the research described in this report was the construction of a well-rounded preschool program for exceptional children based on the application of empirical behavioral principles (Skinner, 1953 and 1958; and Bijou and Baer, 1961 and 1967). This program has been designed for children who are exceptional in the sense that their development and behavior are marginal or borderline; they are too retarded or disturbed to be admitted to school, but not sufficiently deviant to require institutional residential care. The primary aim has been to devise an educational environment which terminates or slows down the processes that make for more marked retardation and maladjustment and helps the children achieve a level of social and intellectual performance which would make them acceptable for school attendance.

This research was inspired by the results obtained in applying behavioral principles to remediate either mild or severe problem behaviors in young children. A series of experimental studies in the natural settings of everyday living demonstrated that mild behavior problems in preschool children could be adequately treated by teachers in a nursery school (e.g., Harris, Wolf, and Baer, 1964); specific behaviors in grossly retarded children and severely disturbed youngsters could be modified by child-care workers in a psychiatric hospital (Wolf, Risley, and Mees, 1964), by teachers in a state residential school (Wolf, Birnbrauer, Williams and Lawler, 1965), and by mothers in a child guidance clinic (Wahler, Winkel, Peterson, and Morrison, 1965), and in their own home (Hawkins, Peterson, Schweid, and Bijou, 1966).

The present research began with an inquiry as to whether youngsters with severe behavioral problems could be treated in a nursery school by teachers trained in the application of behavior principles. During the year 1964-65, four children were enrolled in the experimental nursery school of the Developmental Psychology Laboratory, University of Washington, to explore behavior modification programs, reinforcement contingencies, and methods of quantifying changes in behavior in each child. One child, a seven-year-old boy, was autistic (Johnston, 1968); the second, a three-year-old girl, was incoordinate and without speech; the third, a four-year-old boy, was hyperactive and excessively aggressive (Sloane, Johnston, and Bijou, in press); and the fourth, a four-year-old boy, had limited speech development and drooled profusely (Johnston, Sloane, and Bijou, 1966). The work with the three-year-old girl is described in Appendix A as an example of the analyses made, the programs and procedures employed, and the outcome.

Findings from the first year's work clearly indicated that trained teachers can indeed successfully apply behavior principles to grossly retarded and disturbed children in a nursery school setting. Hence the second year's work carried out at the University of Illinois in 1965-66 was focused on (1) refining and extending behavior modification techniques with emphasis on the shaping of verbal behavior since this was a prevalent form of deficiency in most of the children, and (2) instituting preacademic and academic procedures so that part of the program would be devoted to helping the child compensate for his defective developmental history. Six children were enrolled: a four-year-old Mongoloid boy, a five-year-old extremely retarded and shy girl, a four-year old retarded boy with no speech, and three highly active and extremely aggressive boys, one four, one five, and one six years of age. All six children needed speech and language programs either to initiate verbal behavior or to improve it. An account of the procedure, program, and outcome for one of the aggressive boys is given in Appendix B as a sample of the work carried on during that year.

It became apparent after the second year of study, that severely retarded and disturbed children could be helped to eliminate behaviors that interfere with learning and to build essential social and intellectual repertories in a nursery school setting. Unfortunately, because of time limitation (half-day sessions over one academic year), the children could not be given sufficient training to enable them to enter a regular community school. Hence the third year of research (1966-67) was devoted to developing a program for children who were less severely disturbed but enough of a problem to be excluded from public school.

The objectives of the research during this year included (1) adapting the behavior modification techniques developed to the new group, (2) extending the preacademic and academic programs, and (3) exploring a behavioral analysis technology for training teachers to conduct a nursery school for exceptional children, and training parents to maintain and extend the desirable changes in behavior in their children.

The fourth year of study (1967-68) was devoted to refining and formalizing the materials and procedures developed during the previous year. This report gives an account of the operation of the special nursery school and ancillary training activities during the fourth year.

As a preface, a brief description is given of the principles applied in developing the teaching technology for exceptional children (Chapter 2), and the research strategy employed (Chapter 3). These background considerations are presented in order to make explicit the nature of a research design for a technology of teaching.

Following the statements on the principles and the research methodology, there is a description of the children in the program (Chapter 4), and the general organization and operation of the preschool (Chapter 5). The next four sections give more of a detailed account of the special features of the program. They include the reading, writing, and arithmetic programs developed (Chapter 6), the behavior modification procedures (Chapter 7), the parent program (Chapter 8), and the teacher training program (Chapter 9).

2. Brief Description of the Principles Applied

For the most part, educational processes, special or otherwise, deal with changes in operant behavior. Operant behavior is observable behavior controlled by consequent stimulation in the form of reinforcement contingencies. Included in this category are social, motor, intellectual, linguistic, cognitive, and verbal behavior. Operant conditioning is the process of strengthening or weakening of operant behavior. Operant conditioning is not the same as Pavlovian or reflex conditioning. Reflex conditioning refers to strengthening and weakening of behaviors (such as salivary responses) that are controlled by antecedent or prior conditions in the form of unconditioned and conditioned stimuli. (To clear up a point that is often a source of confusion, let us add that operant behavior can be controlled by antecedent stimulation as a cue for a response, but the power of an antecedent stimulus in the control of operant behavior rests entirely on the reinforcement history of the particular individual.) Reflex behavior is closely related to biological functioning but may also be a part of the strong forms of emotional behavior.

As a result of about fifty years of research, mostly in the laboratory, a great deal is now known about the conditions that establish, eliminate, and maintain operant behavior. And due to the vigor of current research in this area, new facts are continuously being added to this store of knowledge.

During the past fifteen years, principles of operant conditioning have been applied to many areas, but mainly to education (e.g., programmed instruction) and psychotherapy (behavior modification). Those familiar with the history of the relationship between psychology and education will note that, in the past, attempts to apply psychological principles to the educational endeavor required the practicioner to make inferences about the equivalences between aspects of the applied problem and hypothetical concepts and theoretical principles. In contrast, applications of empirical behavioral principles can be made without modification or translation. The conditions, defined in functional terms, that strengthen and weaken operant behavior are the same both in the laboratory and in the classroom. The latter situation is, of course, far more intricate.

Skinner (1968) points out with clarity the relationship between operant conditioning and the teaching situation.

> The application of operant conditioning to education is simple and direct. Teaching is the arrangement of contingencies of reinforcement under which students learn. They learn without teaching in their natural environments,

> but teachers arrange special contingencies which expedite learning, hastening the appearance of behavior which would otherwise be acquired slowly or making sure of the appearance of behavior which might otherwise never occur (pp. 64-65).

For the teacher to do what Skinner describes, she must be well versed in all the components involved in changing operant behavior, viz.: the current behavior of the child; the stimuli (cues) and response requirements to help the child progress in knowledge and skills from his current status to the objectives of the training program; the programming of consequent stimulation to attain and maintain desired learning; and the managing of setting conditions to keep the child's motivation stable and strong.

The body of this report will describe and discuss the above principles as they apply to the assorted aspects of the task of teaching the handicapped child. A functional analysis of the retarded child with problems is presented below.

A Functional Analysis of the Retarded Child with Problem Behavior

Retardation and problem behavior, mild or profound, evolve through the genetic and personal history of the individual. Acquisition of cultural forms of behavior, skills, and cumulations of knowledge is slow and irregular (1) when the child's biological make-up adversely affect his interaction with the physical objects and people which make up his effective environment, and (2) when essential physical objects and intimate people are lacking, or when those in his environment interact with him in ineffectual ways. They may, for example, be unresponsive, punishing, or frustrating.

A more detailed analysis of the conditions which generate deviant behavior is presented separately only for the purpose of exposition. In reality, they interact in intricate ways throughout development.

Pathological anatomical structure and physiological functioning. The anatomy and the physiological functioning of a child are viewed in terms of their influence on the child's *ability to make responses and to provide stimuli* for himself and others. Irregularities in anatomical structure (e.g., Down's Syndrome) and physiological functioning include defects in the action of the sense organs, the muscle-skeletal system, the neurological and endocrine systems, and other systems and glands of the body. Such flaws may originate in genetic processes or in injurious chemical and mechanical events during the prenatal period, at birth, or after birth. Since biological anomalies may range from mild to severe, their effects on behavior may extend from inconsequential to devastating.

Obviously the behavioral aspect of an interaction with the environment may be affected by impairments of the responding parts of the individual's body and his internal coordinating systems (e.g., the central nervous system). A child cannot possibly learn a response if he does not possess the anatomical parts and/or the physiological functioning which make up that response. A child with impaired vocal chords cannot be trained to make all the sounds necessary for normal speech. (He may, of course, be able to learn different responses that will serve the same purpose in the sense that they will affect the environment in the same way. Whether or not he does learn compensating behavior depends on the effectiveness of the instruction he receives.)

Not so obviously, but just as truly, the stimulus aspect of an interaction may also be affected adversely by the child's biological impairment. When skills in body management and locomotion are inadequately developed, the number and type of physical and social stimuli available for contact are curtailed. Restricted mobility, then, generates limited behavioral repertories. A child limited to lying on his back can only experience stimuli that are above his body or those that are brought into his line of vision; the child who can move about on his own can provide himself with all sorts of novel physical and social opportunities. Depending upon the type and extent of his biological impairment, a child may never have access to certain stimuli.

The physically impaired child may also be deprived of opportunities for learning because of the way he looks to people. His physical appearance could be repugnant or unappealing, causing them to avoid him, to leave him as quickly as possible, or to behave toward him in an altogether indifferent, or even rude manner. A child, physically impaired or not, treated in these ways, is denied basic intellectual and social interactions that only people can provide.

Reinforcement histories. One kind of reinforcement history that results in retarded development consists of interactions in which positive reinforcement for social and intellectual behaviors are ineffectual. For example, positive reinforcement may be practically non-existent in a family in which the parents are in poor physical or mental health, or are under the perpetual influence of drugs or alcohol. Under such circumstances the child's social behavior (including language) may not develop. The required social reinforcements (e.g., play, cuddling, etc.) are absent. Another kind of ineffective environment may be that of a reinforcement history with infrequent and small amounts of reinforcement. Such may be the case in an under-staffed child care institution, or the social treatment given to a biologically unattractive child. Still another kind of ineffectiveness may be the indiscriminate use of reinforcement. For example, parents of a chronically sick, disabled or incapacitated child may, in an effort to be maximally helpful, be indiscriminate in the behavior they reinforce. They may almost continuously and without question react to each and every one of the child's needs and demands, reasonable or unreasonable.

A second kind of reinforcement history that can markedly retard behavior development and establish problem behaviors involves the practice of constantly using negative reinforcers which eventually leads the child to develop almost exclusive and persistent escape and avoidance behavior. His repertory of responses to aversive stimuli, although limited, dominate all other behavior.

A third type of reinforcement history that leads to retardation is a kind that also establishes strong problem behavior. No parent "in his right mind" would want to develop problem behaviors in his child. But such problem behaviors may evolve precisely because the parent dislikes them and he finds that attending to them reduces or eliminates them at that time. This type of interaction strengthens both the problem behavior of the child and the attending behavior of the parent: the child is positively reinforced by the parent's attention and action and the parent is negatively reinforced by the action that has terminated the child's problem behavior. A familiar example of this interaction is the child who gets what he wants by having a temper tantrum. The chances are that temper tantrum behavior was established by the parents' compliance with the condition that instigated the tantrum. The chances are also that the parent "gave in" to terminate the distasteful or even an alarming behavior displayed by the child.

Strong and persistent problem behavior leads to retardation in two ways. First, it may become the child's major way of responding to practically all situations. If a child is constantly screaming or having a temper tantrum, his learning of new socially and educationally desirable behavior is, of course, slow, or even static. Second, strong problem behavior may well discourage people from approaching and engaging in educational and social interactions with a child, a situation similar to that of a youngster who is avoided because of his repellent appearance.

Discrimination and perception history. If there are few or no occasions for the child to interact with responsive people and interesting things, or if the occasions presented are inept from an educational point of view, there would be few opportunities for him to acquire and retain socially desirable behaviors. These behaviors include (1) skills in body management, manual dexterity, crawling, walking, running, jumping, skipping, climbing, and skating; (2) the transformation of sounds into words, phrases, and sentences; and (3) the relating of words, spoken or written, to things, symbols, and other words. Thus it is more than likely that a child reared under such circumstances would remain grossly uncoordinated, unskilled, and uninformed in the social practices of his culture.

The following are three of many situations in which the discrimination and perception histories may be meager. (1) When the child is treated as though he were abnormal or chronically ill. A study of a three-and-a-half-year-old girl showed that the infantilization practices of the parents prevented speech development and resulted in gross motor incoordination in the form of frequent stumbling and falling. (See Appendix A.) (2) When the environment is thinly populated with stimulating people and interesting things. People are necessary for arranging the environment so that the child can learn intellectual skills and develop a store of knowledge; people are necessary for creating the opportunities for development of manners and morals, and they are necessary for providing circumstances which establish values, interests, and attitudes appropriate for community life. (3) When the environment is devoid of essential physical and cultural elements because of economic and social circumstances.

Severe contingent aversive stimulation. Another set of circumstances which may retard development and create problem behavior is "contingent aversive stimulation." This phrase refers to punishment, to "hurts" (e.g. "shots") inflicted on the child for health purposes, and to injuries sustained in accidents. Contingent aversive stimulation has many consequences on behavior. Here are three. First, it may stop ongoing behavior, that is, have suppressive effects. If the stimulation is moderate, it is likely that the suppressed behavior will reappear. A skinned knee from running too fast serves to slow down the active youngster for only a matter of minutes. If the aversive stimulation is severe, however, it is likely that the suppressive effects will remain for some time. More than one clinical account has been given of a young child who stopped talking following traumatic punishment by an intoxicated or severely disturbed parent. Second, aversive stimulation may create conditioned aversive situations; formerly neutral situations can become distasteful or frightening. Powerful avoidant reactions are like many biological anomalies in that they foreclose many occasions for the child to learn new reactions. Third, aversive stimuli may evoke physiological responses, such as gastric reactions, which can affect detrimentally the biological functioning of the child and thereby reduce his potential for behavior development.

Summary. The retarded child with behavior problems is analyzed as a child with a limited repertory of behavior resulting from the interactions in his genetic and personal history. Conditions and processes which create restricted repertories include abnormal anatomical structure and physiological functioning, inadequate reinforcement, discrimination and perception histories, and severe contingent aversive stimulation. There are, however, other processes. They include histories involving loss of environmental support, strong conflict, frustration, and anxiety. It should be emphasized that these other conditions and processes do not include concepts like "defective intelligence," "clinically-inferred brain damage," or "familial retardation".

3. The Research Strategy

Educators and measurement psychologists have created powerful research tools for the group comparison of different methods of instruction and different kinds of psychotherapy. Findings from research using these techniques have been helpful in making administrative decisions and in providing information about the learning attained under the different conditions observed. They have not contributed to knowledge on the acquisition of educational behavior. They have not done so because the procedures employed do not measure the interactions between changes in behavior and their determining conditions. This deficiency is undoubtedly one of the reasons for the recent flurry of papers re-evaluating applied research in education (e.g., Gallagher, Stolurow, and Whitlock).

The strategy of the research reported here is derived from the direct application of behavioral principles to the classroom situation. This means that the classroom is viewed as a complex environment designed to expedite the learning of social and intellectual tasks required for adequate social living. The teacher is the most important part of this environment, for it is she who arranges the essential conditions and contingencies. To discover how she might make the situation be maximally effective, a series of interrelated studies are conducted. All aspects of the teaching process--motivational, curriculum structure, academic materials, stimulus display practices, prompting techniques, discipline methods, and parental assistance, etc.--are analyzed and evaluated. It is apparent that the objective of this research is not the discovery of a touchstone for education.

The data gathered are usually in the form of frequencies of occurrences of objectively defined behaviors and stimulating conditions. And the research design usually involves a single subject, i.e., a child is observed under several baseline and experimental conditions to evaluate the existence of a functional relationship between a class of behavior and the conditions which are manipulated (Sidman, 1960; and Bijou, Peterson, Harris, Allen, and Johnston, 1968). Demonstrated relationships are incorporated into the program as materials, teaching and management procedures, or both, and are evaluated further on other children, observed one at a time. Negative findings lead to a re-evaluation of the conditions manipulated and a new experimental study. The objective of the expanding network of interrelated studies is to provide an empirical basis for a set of teaching practices that can be utilized in any preschool and eventually in any class for exceptional children, given the appropriate programmed materials and a teacher trained in application of behavior principles. That this procedure leads to a realistic goal is demonstrated by recently published reports in educational settings (e.g., Becker, Madsen, Arnold, and Thomas, 1967; Bijou, Birnbrauer, Kidder, and Tague, 1966; Quay, Werry, McQueen, and Sprague, in press).

The strategy described might be called intra-system research in that experimental studies are conducted to evaluate the applications of behavioral principles and to refine and integrate them into effective procedures. When this phase of the research results in a coordinated technology, group comparison research (inter-system research) can be embarked upon to evaluate the results of this approach in comparison with others.

4. Description of the Children

Children were enrolled in the nursery school from a list of referrals from agencies in the Champaign-Urbana community. Reasons for referral include mental retardation, brain damage, emotional or mental disturbance, severe problem behavior, and learning disabilities and learning problems. However, these problems were almost always intermingled so that a meaningful label for each child would be extremely difficult.

The typical referral sources were the school psychologist, social worker, school nurse, teacher, pediatrician or family physician, psychiatrist, family and child services, and the parents themselves. The referral was usually made after the child had received the special services which the school system offered with no evidence that the original problem had been remediated. Special services included special education classes, guidance programs, psychological testing, medical examination, or special assistance and attention from the teacher. At the time of referral, the teacher often recommended that the child not continue in her class or the school refused to allow the child to attend class. In cases involving severe difficulties with a child, a member of the school staff would often attempt to have a child admitted to the program even before he had attended school and without utilizing the special programs in the school. Usually there were medical reports and psychological tests for a child. Frequently there also were reports which included descriptions of problem behaviors.

Tests administered by the referral agency or school personnel usually indicated that these children were of low normal to borderline intelligence. In some cases, there were no test results because it was determined that the child was untestable. The academic level was almost always retarded and most often at a pre-school level. The referral source usually qualified the testing results by stating that the tests did not indicate the potential functioning level of the child.

Preceeding or upon admittance to the nursery school, the Peabody Picture Vocabulary Test and the Wide Range Achievement Test were administered to each child. At the time of testing, the range of chronological age was 4 years 1 month to 6 years 7 months. The average age was 5 years 5 months. The Peabody Picture Vocabulary Test yielded an average IQ of 83 with the range from not testable to 97. The average mental age was 4 years 3 months, with the range from not testable to 5 years 10 months.

The Wide Range Achievement Test yielded scores from not testable to first grade. The average scores in reading and arithmetic fell at the early kindergarten level. Again, one child was not able to be tested.

The families of these children represented all socio - economic levels of society. The educational background of the parents ranged from grade school education through doctoral degrees.

5. Organization and Operation of the Preschool

As was noted earlier, the preschool is arranged so as to provide a marginal child with an educational environment which will help to repair the defects developed through his personal history. All features of the program are designed to apply behavioral principles in order to achieve this objective. More specifically, efforts are aimed at (1) eliminating behavior which interferes with socio-academic learning and strengthening desirable cultural behavior and "study habits" (behavior modification); (2) providing instruction in essential academic knowledge and skills (programmed academic subjects); (3) promoting motivation for academic achievement (contingency management); and (4) maintaining the changes in behavior and motivation outside the classroom situation (contingency management and parent training).

Physical Structure

The preschool classroom is a large room, 19 feet by 34 feet, with three smaller rooms partitioned off at one side: a bathroom with child-sized toilets and sinks; a wet room with a sink for water play, and a floor suited for activities such as painting; and a quiet room with dolls, doll beds, and play-sized kitchen equipment. Both the wet room and the quiet room are readily alterable so that they are suitable for library activities or a preferred playroom. Each of the three rooms is equipped with suspended microphones and each has large windows facing the main classroom, making activities in those rooms easily observable and audible from the main classroom and from the observation room directly opposite. This room, accommodating about six people, is elevated about three feet above the main classroom, its one-way mirrors projecting into the classroom at a 30-degree angle, thus permitting an unobstructed view of all the areas. Directly below the one-way mirrors in the classroom are three small booths used by the children for academic work. The classroom is equipped with reading materials, large building blocks, and table toys such as small blocks, beads, crayons, paper, scissors, etc.

One floor below the nursery school room there is a series of small rooms each equipped with listening and recording devices and each having an adjoining observation room with a one-way mirror. These rooms are used for the individual study of children and for student and teacher training.

A large, fenced, outdoor play yard in which there is a variety of variously-sized wheel toys and play equipment completes the physical facilities.

Contingency Management

Throughout the school day, the teacher uses contingencies which have been found to be effective for each child so as to strengthen appropriate social behavior in informal programs and academic behaviors in formal programs. Whenever possible the contingencies are social. When social contingencies are not effective, tokens are used to strengthen desired behaviors and to build up a reinforcing function for social stimuli.

Social reinforcement takes the form of teacher and/or peer attention either through praise, physical contact, or proximity. For example, a teacher may wish to demonstrate to a particular child a desirable form of behavior. Looking about, she quickly spies another child, close to the first, who is engaging in that specific behavior, and reinforces him by patting his head and smiling. Should the first child then, or later, behave similarly, the teacher would immediately reinforce him.

Peer reinforcement, which seems to be a strong reinforcer, can be manipulated by the teacher with such comments as, "Look, John, how nicely Bobby is sharing his blocks with Steve." Children are quick to respond to such a cue and will frequently add their own praise and attention.

When tokens are used they are always paired with praise, attention, and confirming remarks to increase the reinforcing power of these social stimuli. Tokens are X-marks entered on a small note book page with space for 24 marks. Marks are given for making correct responses to academic material, for paying attention and other good study behaviors. At a definite time each day, "exchange time," the mark pages which are filled are traded in for brightly colored stickers, small toys, edibles, or preferred play activities.

The token system is considered extremely serviceable because it is a way in which all children can be reinforced effectively (Birnbrauer and Lawler, 1964). It allows the teacher flexibility in dispensing as many tokens as are needed to initiate new learning and maintain old learning. Further, it provides for individual preferences since tokens are exchangeable for a variety of items or activities selected by the child himself. Marks can be presented so subtly that little or no disruption of work occurs, or presented so obviously as to call attention to desirable behaviors for the benefit of other children. Initially, marks are generally dispensed at a high rate in order to strengthen appropriate behavior. Gradually, as the behaviors occur in higher frequency, marks are given less frequently, and become a matter of maintaining and generalizing desirable responses. This is achieved by giving marks on an intermittent schedule and by varying marks with social stimuli.

Undesirable behaviors are weakened by "time out" (T. O.) from positive reinforcement and by extinction procedures. Considering the appearance and the behavior of the teacher to be positive reinforcers, one type of T. O. is accomplished by removal of teacher attention (She assumes a neutral facial expression, lowers her head and averts her gaze.); removal of teacher proximity (stepping away from the child); and removal of the child (taking him to another room) for a brief period. Extinction procedures require no reaction by the teacher and children to the behavior to be eliminated. In many instances the children are instructed not to respond at all to a particular behavior of a child and are reinforced by the teacher for cooperating.

Curriculum and Operation of the Class

The nursery school day is arranged to simulate as much as possible a normal classroom, providing maximum time for individual work on academic subjects. The format below evolved from a series of evaluations.

8:45 - 9:15	Arrival, greeting, play in large classroom, and academic sessions
9:15 - 10:00	Clean-up, show and tell, general discussion, story time, and academic sessions
10:00 - 10:30	Wash hands and snack time
10:30 - 11:00	Outdoor play
11:00 - 12:00	Quiet table play, crafts, and academic sessions
12:00 - 12:30	Lunch
12:30 - 1:00	Nap and outdoor recess
1:00 - 1:15	Trade-in of marks and teacher-directed activity
1:15 - 1:35	Preferred playroom activity and play in large classroom
1:35 - 2:00	Music and games
2:00 -	Dismissal

Arrival, Greeting, Play in Large Room, and Academic Sessions

Each activity provides opportunities for strengthening particular behaviors in each child. During arrival time each child is greeted by the teacher, assistants, and classmates. He is encouraged by contingency management to respond cheerfully; he is trained in gradual stages by differential reinforcement for successive approximations to put his coat on a hook, his boots, gloves, and lunch pail beneath the hook, and his show-and-tell article on a shelf; he is encouraged to engage in an activity at a table or elsewhere in the room. After the routine has been established, little or no prompting is necessary. However, each child is approached according to a program (informal but explicit) for his own behavioral problems or deficits. Here are two examples.

Johnny, a boisterous and aggressive child, is reinforced on arrival at school for his cheerful greeting. Ignored are his aggressive speech and fantasy comments, such as, "I'm mean today." "I'm out to kill someone, so you'd better be nice to me." "The police are out there. They hear me talking to you." On the other hand, appropriate social and verbal behavior directed at teachers and peers, sharing of experiences, and play are reinforced socially or with tokens.

Henry, a highly distractible youngster, is instructed, after the usual greetings, to select a toy from the shelf and to play with it at the table. He receives teacher attention for sustained activity, but comments inappropriate to his activity directed to her are ignored. Examples of such remarks are, "Oh, Mrs. H., I know what you are doing!" "I see that!" "That's for us, isn't it?" Also ignored are his overly affectionate responses toward other children. Sustained interaction and cooperative play with others, however, is given teacher attention.

Clean-up, Show and Tell, General Discussion, Story Time, and Academic Sessions

During the next 30 to 40 minutes the children, seated in a circle at the teacher's feet, engage in several brief activities. Participation is contingent upon sitting quietly in Indian fashion and upon raising a hand for permission to speak. Children showing items are trained in becoming more and more proficient in talking to a group. Show and tell provides a situation in which participation is contingent upon the child's behavior as a listener--a part of an audience. A child who does not attend to the speaker is not permitted to share his show and tell on that day. Children with undeveloped speech repertories are encouraged to talk frequently.

Storytime is a period of entertainment for all the children, particularly the older ones. Remaining in the group is contingent upon attending to the story, sitting properly, raising hands for comments, and waiting in an orderly manner for a turn to look at the pictures in the book. Part of this activity involves reinforcing the younger children for identifying objects, defining words, relating the action to their own experiences, and recalling events in the story.

Following storytime there is a brief discussion of events including the day, month, year, forthcoming holidays, the season and weather. The stated contingencies for remaining and participating in the group remain in effect; however, the discussion is now geared to the older children. Their relevant comments are reinforced both by the teacher and classmates who respond to a question by the teacher, as, for example, "Johnny, I thought Vicki gave a good answer. Didn't you?"

During show and tell, storytime and general discussions, the teacher reinforces verbally and/or by physical contact and dispenses marks for appropriate social behavior. Contrarily, when disruptions occur, she averts her gaze, puts her head down, and waits until the group is quiet and attending.

If a child engages in a mild form of disruptive behavior, such as snatching an object from a child, he is given a mild form of time-out from the group. The teacher takes him to the opposite side of the room and tells him to sit there quietly until he is invited to return. Seldom is a child kept out of the group for more than three minutes. (In some instances his return may be gradual, in which case the child is allowed to move closer to the group a few feet at a time. This is especially true if the behavior is of high frequency, and moving toward the group is made contingent on a series of appropriate responses. Upon returning, the child is given an opportunity for reinforcement for desirable behavior or an approximation to it. A child whose behavior is grossly disturbing to the group is given time-out by removing him to a room by himself for several minutes.

Wash Hands and Snack Time

Once seated at the snack table, children are designated to help serve the food. Since it is reinforcing to be a helper, the assignments are given to those who washed quickly, and/or are sitting quietly. For example, one child pours himself a cup of juice and passes the pitcher to the next child, one child passes the cookies, one child removes the cups, etc.

Snack time activity is used both for shaping desirable eating and social behaviors, and for providing a period of spontaneous conversation and interaction. At first, the teacher found it necessary to stimulate conversation with questions and to reinforce the responses of the children who responded. As the children became better acquainted, the talk became livelier, spirited but appropriate contributions being promptly and frequently reinforced. When snack is over, the children are dismissed to get their coats for outdoor play.

Outdoor Play

Each child is programmed to put on his coat but he may request help with an unusually difficult button or zipper arrangement. For a considerable time two children invariably removed their shoes during the morning hours. This behavior was eliminated by the following procedure. Through the day the children were reinforced intermittently for having their shoes on their feet. If a shoe was taken off, the teacher took it and placed it in a cupboard. When outdoor playtime came, the shoeless child remained inside. Before too long shoes remained on feet throughout the day.

Outdoor time in a well-equipped play yard is generally a time for free play with a minimum of interaction between the children and the teacher unless initiated by a child. However, sharing of toys, sustained interaction, cooperative play, and novel use of toys are carefully noted by the teachers and are reinforced. Destructive use of a toy results in having it taken away for the remainder of the play period; fighting is ignored unless a real danger of bodily injury exists. Undue attention to such incidents is avoided. If, on the other hand, a child is attacked by another, the instigating child is taken without comment to the time-out room.

Injuries are matter-of-factly washed and treated with a cleansing solution and bandaids. The injured child is reinforced for remaining calm and is encouraged to rejoin the group as quickly as he can. Operant injuries (attention-seeking) are ignored by the teacher and by peers at the teacher's request (Hart, Allen, Buell, Harris, and Wolf, 1964).

Quiet Table Play, Crafts, and Academic Sessions

The quiet play time is so designated because during this hour the children meet with tutors for individual work in writing, reading, and arithmetic in another part of the room. This is also a situation in which cooperative behavior can be taught. For example, the teacher may provide a box of blocks and ask one child to sit next to another, and say, "Bobby, you make the road while Johnny makes the garage." The children are reinforced for short interval sharing behavior. As the chains of cooperative behavior increase, intervals between reinforcement are lengthened.

Finally, the quiet play time situation is used for table games or crafts. Again the teacher reinforces quiet participation (normal voice), sharing of materials, novel responses (new uses for the material, non-stereotyped responses). During a crafts session, all artistic participation is reinforced regardless of the quality of the production. In general, the teacher reinforces the child who is using the materials properly; she removes, without comment, the materials from the child who is abusing them.

As some children are engaging in quiet play and crafts, others are participating in the academic session. At the beginning of the school year, each child is pretested to determine to what point in the three academic programs he can perform without error. On the basis of this prerequisite, he is assigned to sets of programmed material just preceding that determined point.

During the academic hour (this procedure is used for the first half-hour of the day (8:45 - 9:15) also) undergraduate tutors work with individual children in the "Three R's" for about 15 minutes each. The child is asked to leave his activity, take his mark card from the board, and join the tutor in a booth. A mark may be given for proceeding to the booth without delay. Reinforcement is also given when the child is seated quietly, attending to the materials or tutor. He reinforces correct responses and handles errors according to program procedure, either by ignoring and erasing, and/or by restating the cue. Ample opportunity for correct responding is given and reinforced.

Individual children are reinforced for particular behaviors, including the following: correct pencil holding, appropriate volume of the verbal response, careful responses, sustained sitting, independent and continuous responding, and answers which are correct the first time. For example, John is reinforced for all responses which are correct on the first trial. Errors, questioning glances, comments such as "No, that's not right," which he makes, are ignored. Corrected responses are acknowledged with merely a nod of the head expression, or with "O. K., that's right." This procedure was decided upon because of John's history of purposeful errors and attention-seeking behaviors.

Each academic session is terminated on a positive note, i.e., a reinforced response. Under no condition does a session end directly after a loud verbal outburst, negative comment, inattention, purposeful error, or refusal to respond. This positive procedure allows the child to leave each session after a successful response that results in reinforcement for the response.

At the end of the session, the child takes his mark card to a teacher who adds her comments of praise for the work he accomplished. The child replaces his mark card in the mark folder and returns to the activity he left prior to the session.

Lunch

The lunch situation provides opportunities to program acceptable table-manner behavior and enjoyable social relationships. Behaviors which are reinforced include eating the sandwich, crusts included, without taking it apart, eating all the lunch, talking only when the mouth is empty, and chewing with the mouth closed. Appropriate table conversation and interchanges are subtly encouraged. Inappropriate behavior at the table (e.g., purposeful spills and smearing contents of sandwiches on the table) are treated in the usual ways for weakening responses.

Nap and Outdoor Recess

At 12:30 the older children are dismissed for outdoor recess. The younger children take a mat from the shelf, the lights are switched off, and naptime begins.

Early in the school year it was necessary to reinforce staying on the mat, lying prone, and keeping quiet. The teacher circulated among the children giving friendly pats and verbal reinforcement contingent on the behaviors enumerated. Gradually she was able to sit in the room giving occasional verbal reinforcement to the entire group or to an individual. Silly sounds during rest time are ignored; disruptive behaviors rate a warning. Disruptive behaviors following a warning result in sending the child to the time-out room for a brief stay.

Music is frequently used for reinforcing rest behavior at naptime. If the children remain quiet for a specified amount of time, the record player is turned on for the remainder of the period. Or, the teacher may play the record after a short period of quiet, and then set a slightly longer time of required quiet before playing another selection. By alternating the music with progressively longer periods of quiet she can approach the desired behavior for naptime.

At the end of naptime, the children are led to the table for a teacher-directed activity or reading, and other activity. Some are given permission to write on the blackboard, play in the doll corner, or play with cars. Noisy activities are permitted so long as the sounds are part of the play behavior and not indiscriminate shouting, pushing, etc. In the meantime, other youngsters are trading in their mark sheets outside the room.

Trade-in of Marks and Teacher-Directed Activity

During the above period, 1:00 - 1:15, the children trade in their mark sheets for their choice of a toy, edible, or preferred playroom privilege. Trade-in time is noncontingent upon the child's immediate behavior, except that one who is behaving inappropriately is not called until he engages in acceptable behavior. In the hall, at the "trading post," the child is verbally reinforced for each page of marks. If there is no full page, the teacher encourages the child to fill a page in time for trade-in the next day. He is told he may choose something from the display board, save for something bigger, or use his sheet to "purchase" ten minutes in the playroom.

Children who save are given an extra mark for doing so. Some items cost one sheet of marks, most items cost two sheets, but none is priced at more than four sheets. The item which a child selects and "purchases" on that day may be played with in the classroom. Likewise, edibles may be eaten in the room.

Prices of the trade-in objects change according to the priority of the item. It was found that objects which were not traded for at the price of two sheets of marks were often desirable when the price was one sheet. If an item is found to have a high priority, the decision might be made to raise the price so that more continuous good behavior will be necessary before the marks are awarded and the object is obtained. In contrast, prices are lowered for some children for whom it has been difficult to find any reinforcing object. For these children, it is necessary to reinforce immediately with something which the child indicates is a strong reinforcer.

Preferred Playroom Activity and Play in Large Classroom

One completed mark sheet may be exchanged for 10 minutes of play in the preferred playroom which contains a large selection of special toys and facilities for water play. The child may choose to spend his time alone or with another child who has also traded in a sheet for the room. A paper clock is set for 10 minutes, and the children enter the room. The door is closed so that unauthorized children may not enter. Children in the large room are permitted to watch through a large window for a short time in the hope that seeing others having fun will enhance the reinforcing value of going into that room. At the end of the ten minutes the child may choose to use another mark sheet to re-enter the room and the procedure is repeated.

Since this is the time of day when the children play with their "purchased" items, very little teacher supervision is needed.

Music and Games

At approximately 1:40 the objects traded in are placed in the children's lunch boxes and the group gathers for music and games, usually selected by the children. Individual performance is encouraged by differential reinforcement of successive approximations. The children are reinforced for participating and for socially desirable behavior. That is, they are reinforced for sitting on the floor and attending to the group activity. Those who sing are praised; those who do not are encouraged to try. Spontaneous participation, such as child-initiated rythmical clapping, is given special attention.

When a child is disruptive, he is removed from the group in the usual way. Upon his return he is watched closely so that he can be reinforced as soon as he displays appropriate behavior.

Dismissal

Dismissal is contingent upon the child's orderly behavior near the end of music session. Often the child is addressed in the song, "Where is Thumbkin?", his name being substituted. Following the child's response to the question, he leaves to get his coat.

6. Reading, Writing, and Arithmetic Programs

Reading Program

The reading program is a sight vocabulary program (SVP) initially developed for residential retarded children at the Rainier School, Buckley, Washington (Bijou, Birnbrauer, Kidder, and Tague, 1966; and Birnbrauer, Wolf, Kidder, and Tague, 1965). The research upon which it is based was supported in part by a grant from the National Institute of Mental Health, U. S. Public Health Service. The material consists of pre- and posttests, one-word and two-word programmed sets, remedial sets, exercises in following directions (directions table with small booklets incorporating the basic vocabulary), story books, and picture - phrase cards.

The reading program is designed for the child who, as a starting point, can discriminate and match groups of four letters. Upon completion of the program he is able to read in sentences the words in the program and he can respond to these words when they appear in original stories and primary readers.

At the beginning, and throughout the program, pre- and posttests are given as the child progresses. The first pretest contains the 10 words comprising the first 10 sets of one word each. Those words which a child can read are eliminated from his program sets; the emphasis is on the recognition of new words. At the end of each 10 sets the child is tested, one word at a time, on those 10 words plus the pretest words of the next 10 sets.

The reading sets, mimeographed on 8½ x 11-inch sheets, are placed in a Min-Max II teaching machine which the child has been taught to operate independently through a page of materials. Each one-word set introduces a new word, and each set if made up of approximately 20 lines of tasks of two types--discrimination and simple recognition. When a discrimination task appears in the window of the machine, the child is asked to "Point to 'see' and say it." There are three choices from which to select the answer. In order to assure success in his first exposure to a word, the three choices contain only that one word, "see", and two dashes of comparable length. If the child responds correctly, the teacher reinforces with, "Good," "Fine," "Right," or any other approving word, and the child proceeds to the next line. If he makes an error, the teacher corrects it and then repeats, "Point to 'see' and say it." The correct response is, of course, reinforced at once. Another incorrect response is followed by a repetition of the procedure. In every instance, social reinforcement is delivered immediately and systematically for all correct responses.

The second time, and a few times after that, the new word appears in the one-word sets with two nonsense syllables. At about the sixth line, three actual words make up the choices from which the child is to select the correct word. The teacher's instructions are always the same. Early in the program there are ten exposures of each new word. As the child progresses, the number of such tasks is reduced gradually to seven. Old words are interspersed with the new for review.

The second type of task--sight recognition--is a presentation of the word alone. The teacher says, "Point to the word. What does it say?" If the child cannot read it, he is told the word and is then asked again. The word is presented alone several times before it is included in phrases and sentences composed always of words previously learned.

The two-word sets, as their name implies, introduce two new words in one lesson. They have the same format as the one-word sets, but contain fewer repetitions. This enables the child with a low error rate to move more quickly through the program.

Two hundred words are introduced in this beginning reading program. Sets 1 through 60 are one-word sets; sets 40 through 200 are two-word sets. The twenty-set overlap provides the slower child with more opportunities to lower and stabilize his error rate before tackling the two-word sets.

When the daily record indicates that the child has made no more than two errors in the set, he is considered to have successfully completed the remedial set. The remedial sets are similar to the original sets, except that the remedial word is presented alone or in a simple sentence.

In addition to the daily error record, the percentage error per set is computed and graphed weekly for each child and for the entire group. This record-keeping system enables the teacher to determine when the child is ready to progress from the one-word to the two-word sets, and helps her also to determine the effectiveness of each item in the SVP program.

A wall chart with the children's names listed in a column at the left, and 200 numbered boxes, one for each SVP set, beside each name, shows the exact position of each child in the program. When a child completes a set, a check mark is placed in the appropriate box beside his name. Story books, direction books, and picture-phrase cards are presented in a definite order following specified sets. Completion of these are also recorded on the wall chart.

If, when he is given a pretest, the child already knows the word, this notation is also marked on the wall chart and the child is not required to work through that set. The chart thus aids the teacher in making assignments and assures her that the proper auxiliary material has been presented with its proper set.

The story books, directions table, and picture-phrase cards do not introduce new words; only words previously learned in the SVP and the new word for the day are included. These reading materials serve to test reading comprehension and to make the words more meaningful through their association with an object or a picture of an object. There are three storybooks which range in length from four or five simple sentences to five or six paragraphs with dialogue, and with questions to be answered at the end.

The directions table consists of a large table, many small toy articles, each of which represents a noun in the reading program, and small books containing six numbered pages. The child is given the book and is told to read each page and carry out the instructions. The pages contain phrases and sentences such as "a purple cow," or "Put the little horse in a box under the table." The child's task is to place the proper article on the large sheet of paper ruled into squares numbered to correspond with the numbered pages of the book.

The following procedure is used to teach the child to work alone at the directions table. For the first few weeks the teacher stays with the child while he works, praises him for each correct response. If he omits a placement, the teacher asks him to read the page aloud to her, one complete phrase or sentence at a time, and then asks him what is missing. The correct response is again followed by reinforcement. When the child has thoroughly mastered the mechanics of the tasks and can work quickly, the teacher moves her chair away from the table, thereafter attending to him only when he raises his hand to indicate that he needs help or has completed the page. The child is gradually trained to work independently for longer periods by being required to raise his hand after he has completed two pages, then three, and finally when he has finished all six. In turn, social reinforcement is also given only after the completion of two, three, and six pages respectively.

The picture-phrase cards consist of 5 to 14 pictures, each mounted on a sheet of 8 x 12-inch black paper, and of small cards ½ x 4 inches which contain phrases or sentences. The child reads the card and places it under the picture it describes. During this reading activity the teacher remains with the child and reinforces correct responses on a continuous basis.

Typically, a child has an overall error of about 4.4% with little change when he progresses to two-word sets. Some children have attained a more stable and overall lower error rate of 2.9% for one-word sets and 2.8% for two-word sets. In contrast, a few children have also had more erratic and generally higher error rates than the average.

Since the reading program was not developed in this research project, no revision of the actual sets is being done here. The raw data is sent periodically to the Programmed Learning Classroom at the Rainier School, Buckley, Washington, for analyses and revisions. The remedial sets, however, have been revised as part of this study. During this year (1967-68) the data show that the remedial sets have been ineffectual in decreasing the error rate on the particular word or pair of words presented. Certain pairs of words, such as "girl" and "green"; and "fish" and "find" are consistently confused, indicating that closer discrimination training is necessary. Therefore the remedial sets are currently being revised.

Writing Program

The writing program was constructed anew at the beginning of this year. It is designed for the child who can properly manipulate a pencil to produce large lines and circles on paper. Upon completion of the program which is comprised of 27 sets, the child can produce coordinated lines and circles within acceptable tolerances. He can also combine the basic forms to print and recognize letters of the alphabet and the numbers 1 through 10 on one-inch lined primary paper.

Placement on the program depends on the child's performance on a stroke pretest. The child begins on that set which gives training on the last figure successfully completed on the pretest. The next set given the child introduces him to a previously unlearned figure. Children who can approximate writing alphabet letters do not begin on the basic strokes but start on a set involving the first programmed letter, the small "l".

The initial phase of the program is a tracing sequence designed to teach the basic strokes for letter construction. The starting point is tracing horizontal and vertical one-half-inch lines. Exercises with vertical lines are first because they can be performed successfully by a child who can manipulate a pencil. As the child produces a more controlled line, the line is extended to one and one-half inches, a line longer than the terminal task requires. This same progression in size applies to each of the figures.

Two sheets of paper placed inside a plastic folder comprise the materials for each writing set. The top sheet (onionskin) provides the child with cues for pencil movements. The sheet below it has the models which give the tolerance limits for each of the strokes and letters.

The onionskin has a green dot and a red dot to indicate the starting and finishing points for each figure. There are tracing exercises on each page.

Through the onionskin the darkened area (which sets the tolerance limits for each tracing) of the other sheet is visible directly below the colored cues. The darkened area varies from widths of 3/4 inch to 1/8 inch. The 3/4 inch tolerance width was selected as a starting point because it was demonstrated that a child could move from dot to dot, although with weaving movements, and yet meet the criterion of a correct response. Thus his initial responses could be reinforced. The shaping of more coordinated responses followed as the tolerance allowances in the models were narrowed to the approximate width of a pencil mark.

One-inch letters, sized according to primary paper requirements, are presented in order from the least to the most complex. The format used in the above sets remains the same for both letters and numbers with two exceptions: (1) The margin for error remains constant at 1/8 inch, and (2) the third line of models on the onionskin paper is marked to resemble primary paper with a heavy top and bottom line and a broken middle line. This is done to facilitate the transition to writing on typical school-lined paper.

Criterion for proceding in the program through the first three steps of the letter writing procedure is five consecutive correct (coordinated) responses. A response is considered correct when the child's line starts on the green, ends on the red, and stays within the tolerance limits given by the model. When he has made one or more uncoordinated responses in each of three consecutive figures, the session is terminated following attainment of reinforcement on the third figure. Tracings that go outside of the tolerance limits of the model are erased (wiped off the plastic sheet) and the child is instructed to start over on the same figure. The child uses a felt-tipped writing pen to make his responses. Use of the pen on the plastic sheet (folder) allows easy erasure with a paper towel and continued re-use of each set.

The terminal behavior required of the child before moving from one letter to another is the completion of three legible letters copied on primary lined paper from a model. In order to facilitate the transition from tracing a letter on unlined plastic to copying from a model onto lined paper, several steps containing fading and shaping procedures have been programmed. The placement of one, and then a second, clear onionskin paper under the plastic gradually fades the margin for error, pencil line model, and red and green color cues.

Coordinated responses on primary paper are shaped by the child's responses on the third row of each set which is marked to imitate lined paper. Upon completing these items the child must complete five legible letters copied from a model, and before working with a pencil on primary paper, he practices on lined paper in the plastic folder.

The teacher records each written response and contingencies given on a data sheet. The data collected during the first year (1967-68) are now being analyzed. A group percentage error by step and an individual percentage error on letters are being tallied. On the basis of the findings the program will be revised and the revision will be evaluated in 1968-69.

The writing sequence includes an informal letter recognition program. At the beginning of the session the teacher indicates repeatedly what letter the child is making. As the child progresses through the trials he repeats the letter name without being cued. The teacher records the child's response on a data sheet.

A child who progresses well (this is, making a high percentage of reinforced responses) is put on a confirmation procedure. The teacher names the letter for the child, tells him to write it and indicate when he is finished. She either accepts and reinforces the product or erases it and asks him to do it over.

Gradually, a child is instructed to make two to five responses before confirmation. Next, steps one and two of the letter sequence are combined so that the child places his own onionskin paper in the plastic folder for the fading procedure. The child now receives confirmation and reinforcement twice before writing the letter on primary paper. As long as the child is expected to repeat the letter name as he writes, no difficulties in the letter recognition task occur.

Upon completion of the 27 sets which comprise the program, the child can produce and recognize the letters of the alphabet. He then begins the spelling program which is based on words learned in the reading program. The spelling program, which requires the

Min-Max II teaching machine and the Language Master, presents from one to six words daily. One of the words is new; the others are old, presented for review.

Arithmetic Program

The arithmetic program which was developed in 1966-67 contains 132 sets. It begins with counting from one to five and ends with addition involving carrying across three digits in column form and subtraction of three digits.

At the beginning of this school year (1967-68) each child was pretested in order to assign him to the proper beginning set in the arithmetic program. Initially he found nothing new in the material. These easy exercises permitted him to respond correctly at a high rate and receive many reinforcements from the start.

The program progresses in small steps introducing new arithmetical facts one by one. Each step is mastered before the child is permitted to go to the next one. When a child makes a high error rate on a set, he is given special sets to remediate his problem. These remedial sets may be modified by the teacher until they remove the problem and thereby enable the child to continue in the regular program. If many children have difficulty on a given set, the remedial sets are incorporated into the program. If this is not the case, they are filed for use with other children.

Specifically, the 1967-68 arithmetic program began with procedures to teach the child to count one through five, and to count five objects. The program progressed through pairing groups of dots by number; matching groups of dots, squares, stars, and triangles by number; constructing dots to represent the digit; and constructing a digit to represent the group of dots.

The mechanics of addition using numbers one to five were then introduced. The child counted two groups of symbols and chose the number representing the total. Later he supplied the symbols for the two numbers being added, totaled them, and then selected the correct answer from a choice of three. The typical instructions for later sets were, "Make dots above each number. How many dots are there altogether? Mark the correct answer." Reinforcement was given for each correct response at each step in the chain.

Numbers 6 through 10 were then introduced. The verbal chain (counting sequentially), recognition (naming) and construction of those numbers were taught. Addition using numbers 6 through 10 was introduced in the same manner described above.

Subtraction sets for numbers 1 through 5 and 6 through 10 were introduced next. The instructions were: "Make dots above the first number. Now cross out this many dots (teacher pointed to the second number). Count the dots that are not crossed out. Write the answer here." Again, reinforcement followed each step of the chain.

Next, column addition was introduced. This was followed by work with two-digit and three-digit numbers. The program ended with sets involving carrying with three-digit numbers and borrowing with two-digit numbers.

Initially, a teacher worked with a child to strengthen appropriate study behaviors. A token system ("marks") was used to enable the teacher to give tangible reinforcement for such things as coming to the study booth quickly, starting to work immediately, quiet and correct work, and a successive decrease in error rate. The one-to-one relationship between child and teacher or trained tutor helped to establish the desired high rate of correct responding because the instructor could respond quickly to an incorrect response and give prompts for the correct response. His presence also helped to maintain good performance when tokens and social reinforcers were gradually eliminated.

When the child made correct responses consistently and efficiently, he was given a form of the program which allowed him to write his response, confirm it, and correct his errors by re-doing the problems. The instructor remained with the child until he was able to confirm and correct his answers and still maintain his previous level of constructive productivity.

When working alone, the child completed a page of five problems and raised his hand to indicate the need for confirmation and further instruction. Data showed that change from the one-to-one tutoring to the independent study had little or no effect upon the correctness of the child's work, although rate of work decreased somewhat.

Once the child was responding well under the independent work condition, the teacher began monitoring two children with each child working in his own study booth. The two children were then placed in the same booth after each met the performance criterion. Other children were added one at a time. This procedure assumes that each child has been shaped to do his own work with a minimum of guidance, to move from one problem to the next without undue delay, to attend to his work without being distracted by the other children at the table, and to work quietly. If, at any time, a child showed deficiency in any of these areas, he was either taken from that situation and tutored individually to eliminate the problem or was not allowed to work in the larger group.

Data were collected by the teacher prior to the time the child reached the time he was ready for the sets which had the self - confirmation feature. When the child was on the self-confirmation sets he wrote his answers on the sheet with the problems rather than on the plastic cover. Thus his responses automatically provided the raw data for analysis, and the teacher needed only to record the occurrence of reinforcements and special circumstances.

A record was kept of all correct and incorrect responses and the occasions of reinforcement. From this information, statistics on errors were computed and used to guide the revision of the program for the next year (1968-69).

In 1968-69 a programmed sequence will be developed to establish prerequisite skills for the revised program. It will cover verbal chaining of numbers, counting of objects, recognition of numbers and construction of numbers.

The revised program will begin with discrimination tasks and dot construction exercises for the numbers 1 through 5. Addition and subtraction operations will be introduced simultaneously. The same procedure will be followed for the numbers 6 through 10. The sets with column addition and subtraction involving carrying and borrowing will be essentially the same.

7. Behavior Modification

In this section we will discuss procedures, programs, and techniques for research and development in the modification of behavior problems in young marginally developed children. It is the aim of this chapter to not only give examples of the research pursued, but also to show the close relationship between the research and the application procedures in a behavioral analysis approach.

All children who are referred to a special class are, broadly speaking, referred for one (or both) of two reasons. First, the child may display an excess of inappropriate behavior. He may tantrum, be aggressive, physically and/or verbally, may often behave in a bizarre fashion, or may be overly preoccupied with sexual matters, etc. In other words, he may display some inappropriate response so often that he interferes with his own progress and that of other children. In contrast, a child may also be referred because he lacks a particular set of responses, i.e., displays a number of behavior deficits. In this category we find the shy child, the child without intellectual and social skills, the child who doesn't talk or who is unable to attend to stimuli long enough to acquire new academic or social behaviors. We also find children who fall into both categories. In most cases the excess inappropriate behavior must first be weakened in order to remedy the behavioral deficit.

General Procedures

As soon as a child is admitted to the classroom the staff observes his behavior in an informal fashion. After a few weeks or less the child's inappropriate behaviors are cataloged as well as his behavior deficits. Subsequently decisions are made with regard to which behaviors are not appropriate and must be weakened, and which behaviors must be strengthened. Thus a set of "terminal" behaviors are enumerated. This list specifies the direction or goal of the remedial program. With one child the terminal behaviors might be to increase cooperative play, while with another they may be the reduction or elimination of tantrums, for example.

Once the goal is determined, a program is designed which specifies the procedures used to arrive at the terminal behavior. In the case of a complex behavioral deficit, a series of steps or sub-goals leading to the final behavior may also be specified. Once this is accomplished, the staff begins a search for effective consequences which can be made contingent upon the child's behavior. These consequences may be attention and approval from a teacher, special privileges, access to preferred games, toys, or activities, tokens or marks which can be exchanged for toys or food. Negative consequences might include the loss of a toy, game or activity, or a period of isolation or time out from reinforcement. The frequency of the child's behavior may also provide hints as to potential reinforcers and punishers--high frequency activities being potentially more reinforcing than low frequency activities.

Consequences are then applied to the behavior--usually on a continuous schedule. Thus, every time a tantrum is displayed the child is isolated for a brief period--if that is the consequence employed. Every time the child plays with another child, the child is given attention and approval from the teacher if social behaviors are to be strengthened. Once a behavior has been strengthened, however, the requirement for continuous reinforcement need not be met to maintain the response. Once the behavior has been strengthened, the frequency of reinforcement may be gradually reduced until it is given on an occasional basis. Such a procedure can produce a high but durable rate of response.

Monitoring Procedures

Regardless whether one is doing research or remedial work, it is helpful to employ procedures which allow one to follow the course of behavior over time. Such procedures allow the researcher and/or teacher to assess the effects of a particular technique on the behavior under study and to evaluate the power of the reinforcing agents. This can be especially helpful to the teacher since the data show her how her behavior may affect the behavior of the child. Moreover, the teacher obtains a clear record of the direction of change in the child's response.

Data Collection

When the definitions appear to be reliable, baseline observations are begun. This is perhaps the most important phase of the program in that it is the final step in the diagnostic procedure. Since frequency of response is the basic measure, an assessment of the frequency allows a more precise determination of the deviancy of behavior. Once the baseline appears stable, remedial procedures may be instituted. The change in the child's behavior suggests the effectiveness of the procedures. Procedures may be altered to influence further the child's response or to assess experimentally the treatment effects. A detailed account of the specific steps in observation, recording and experimental design is given in the section on methodology.

Specific Procedures

High Frequency Behaviors

Perhaps the most disturbing behavior exhibited by the young child involves tantrums and aggression. Not only is this behavior distressful to the child, but such responses usually disrupt classroom activities. The following case describes a procedure which was used to eliminate tantrums in a five-year-old boy.

This child, named Harry, was of middle-class parents and had been referred because he was unmanageable in kindergarten. Harry's behaviors included biting, kicking, hitting himself and others, and threats directed to the teacher. Tantrum behaviors were usually precipitated by any slight disturbance in the classroom or a teacher's attempt to make him follow a command or engage in a particular activity.

In Harry's case, behavior codes were drawn up. Tantruming included crying, whimpering, whining, and sobbing. A code was also devised to measure physical contact on the part of the teacher (forcing him to obey) and teacher attention.

After a baseline estimate of tantruming had been obtained, the following procedure was put into effect. Whenever Harry tantrumed for ten seconds or more he was taken from the classroom and placed in an empty room for a minimum period of silence. He was told, "When you are quiet you may come out." The first day Harry went into the room four times for a total of 96 minutes. The second day he went in twice for a total of 58 minutes, the third day, three times, and the fifth day, twice. By the seventh day no tantrums were observed. Harry's rate of tantrums was down to less than 1% of the time. This compares with a rate of 25% of the time during the preceding month before the introduction of the isolation procedure.

The following account illustrates the use of time-out and reinforcement procedures in the treatment of a four-and-a-half year old boy who was highly aggressive and engaged in a great deal of fantasy play (Sloane, Johnston, and Bijou, in press).

The subject, Denny, displayed tantrums and aggressive behavior at such a frequency that he had to be withdrawn from a day care center. He often tried to engage adults to respond to him in his fantasy role, and tantrums followed if they did not. Although his social skills were not well developed, he seemed normal in most other ways.

After defining the behaviors and obtaining a short estimate (baseline) of their frequency, the following procedures were put into effect. First, Denny was given social reinforcement for cooperative and friendly behavior. Denny was also removed from the classroom and placed by himself in a time-out room after each aggressive act not terminated by verbal instruction to stop. He remained in the room until he had been quiet for two minutes.

Fantasy play was also treated by leaving the child when he began to engage in the behavior or otherwise ignoring it by giving him attention for periods of appropriate play. Denny was also given instructions designed to improve his social behavior.

Figure 1 shows the effects of the treatment on physical and verbal assault. During baseline there was an average of 15 physically assaultive acts per day and approximately 5 verbal assaults. Following the instigation of the treatment procedures the frequency dropped to less than two per day, with a low stable rate during the latter half of the study. After the fifth day, verbal assaults were infrequent.

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Insert Figure 1 here

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Fantasy play is shown in Figure 2. During baseline (Period A) it occurred 35% of the time on the average. Appropriate play averaged 39%. Treatment procedures were begun at Point B on Figure 2. Consequently fantasy play rapidly decreased until it occurred around 5% of the time. In contrast, appropriate play increased and remained around 60% of the morning.

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Insert Figure 2 here

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The time-out procedure just described can be an effective way of reducing undesirable behaviors, and should be employed with reinforcement procedures. For example, in the case of a five-year-old girl who was attending to work an average of 70% of the time, when time-out was applied for not attending during the academic period, attention rose to 98%. When the time-out was no longer in effect, attending dropped to an average of 63% and when it was again employed, attending rose to 94%. In this case time-out consisted of removal from the classroom and being placed in a hallway behind a door.

Subsequent procedures with Harry involved the use of time out (isolation in an empty room) to increase his following commands. After certain reinforcement procedures (which will be described later) compliance with requests averaged 83% of the time. When time-out for disobedience was instituted, obedience rose to 96%. When time-out was not longer in effect, obedience dropped to 52%. Re-establishment of time-out brought obedience to a 93% level.

Not all children will respond to an isolation procedure. When such a procedure is not effective in controlling or reducing undesirable behavior, the reinforcing properties of the classroom should be increased. The teacher might install a token or mark system, for example. In this case the child can receive marks for appropriate responses. With such a system the teacher makes time out from reinforcement an even more effective consequence. However, there may be children for whom it is difficult to find reinforcers. In such cases time-out may not be effective. In such cases, attention might well be devoted to building more powerful reinforcers and manipulating the value of primary reinforcers.

Although time-out is used primarily to reduce undesirable behaviors, it may increase desirable behaviors at the same time. In Harry's case, as the tantrum behavior decreased, obedience increased. Percent of requests obeyed averaged 42% before the time-out was applied to tantrums. Afterward, obedience averaged 74%.

Other techniques may also be used to eliminate inappropriate behaviors. For example, a six-year-old boy displayed a high rate of baby talk and thumbsucking. The teacher withdrew her attention whenever either behavior occurred in her presence. In a study of the effect of teacher attention on verbal responses, this same technique decreased verbal responses from 28% to an average of 15%. "Withdrawal of attention", however, needs to be carefully specified in terms of the teacher's behavior. In the case just described the teacher turned away from the child when the child began to talk and did not turn back until she had been quiet for ten seconds. The teacher also turned away if the child spoke to another child while in the teacher's presence.

Extinction may also be used to reduce the frequency of unwanted behavior. For example, an eight-year-old child learned that he could obtain attention by talking about sexual matters. This behavior was diminished when it was ignored, i.e., not responded to in any way by the adult.

Low Frequency of Attending Behaviors

Let us consider the application of contingent teacher attention in the case of two boys who lacked attending behaviors.

Jeff was eight years old, came from a middle class family, and had a mental age of 9.5 years on the Peabody Picture Vocabulary Test. He had been referred from the public school system where he was reported as being very distractible and often failed to complete his school work. When the teacher asked him to write, Jeff usually made inappropriate marks on his paper, watched other children, talked to the teacher about other matters, or got up and played. Despite this problem he did not appear to have any other serious behavior deficits.

A second child, Tim, displayed many of the same problems. Tim had been referred to the class because he was unmanageable in the kindergarten he attended the previous year. His teacher reported he displayed temper tantrums and often behaved as if he were a "monster" by walking like a monster and making strange sounds. Upon admission to the class Tim did exhibit a number of inappropriate behaviors including "monster" imitations. No tantrums were observed, however. In academic sessions, Tim, like Jeff, made little attempt to complete the work assigned.

The children were observed during a one-hour period of daily academic work. During this time the two boys sat at a small table with the teacher. For half the hour the teacher worked with one boy and spent the second half with the other. An observer seated several feet away recorded the amount of study behavior on the part of each boy, both when he was working alone and with the teacher. A second observer was sometimes employed in order to check the reliability of observation. Study behaviors were broken into two categories, working alone and working with the teacher. For Jeff, working was defined as follows:

> Working alone - Counting the number of words; looking at the words; pencil in hand, moving pencil to write name, numbers or words.
>
> Working with teacher - Same as above, and attempting to answer a question asked by the teacher (within 10 seconds); obeying commands (within 10 seconds).

Not working involved leaving the desk, play, scribbling on the paper, irrelevant questions, irrelevant talk, picture drawing, and erasing.

Each hour of observation was divided into 20-second intervals. Work behavior had to occur during the entire 20-second interval in order to be scored. If any other behavior was displayed the interval was not scored.

A similar code was used with Tim, but involved slightly different behaviors. In this case, the study involved:

Working alone

1. Head down, attending to paper or cards (arithmetic tables) in front of him.
2. Moving pencil, writing answers to problems.

Working with teacher

1. Same as above, and
2. "Thinking out an answer" - making lip movements while not looking at or talking to someone.
3. Answering a direct question made by the teacher (within 10 seconds).
4. Complying with a command from teacher (within 10 seconds).

Not working involved looking around the room, irrelevant talk, play with others, guessing an answer, going to the washroom, pencil sharpening, scribbling or doodling, and irrelevant questions.

In Tim's case, he was required to work for 10 or more seconds out of each 20-second interval in order for that interval to be scored as an interval of appropriate study.

Experimental procedure. The study was divided into five stages; a baseline period, the first reinforcement period, a reversal period, a differential reinforcement period (DRO), and a second reinforcement period.

The baseline period consisted of a series of observations of study behaviors. The teacher instructed both boys to work and often assisted them. She would discuss the work as well as unrelated topics brought up by the boys. If a subject left the table he was asked to return. The work for Jeff involved copying 40 letters which were printed on 5 x 7-inch cards. Tim was assigned addition and subtraction problems. Each paper contained a minimum of 24 mathematics problems. The subjects were given attention and praise regardless of their behavior.

First reinforcement period. During this part of the study, reinforcement in the form of attention, including praise, smiles, and pats was given for academic work. Irrelevant conversation, absence from the desk, and other non-academic behaviors were ignored. Beginning in session 13 both subjects received in addition a gold star for each completed page of work.

Reversal period. Following the first reinforcement period, the experimental conditions were altered. The subjects still received praise, attention, and stars, but the reinforcement was not longer contingent on academic behavior. Instead, the subjects were given attention for both academic and non-academic behaviors. Stars were given not for each completed page as before, but at the beginning of each half-hour period.

Differential reinforcement period. Because of the failure of the subjects' behavior to change markedly during the previous experimental period, a period of differential reinforcement was instituted. This operation involved a further change in the reinforcement contingency. In this case reinforcement was given for any behavior other than studying. The subjects were ignored when they worked. As before, stars were given at the beginning of each half-hour period.

Second reinforcement period. During this portion of the study conditions resembled those of the first reinforcement period. Praise, smiles, pats and other forms of approval were dispensed by the teacher contingent on study behavior. Stars were given for each completed page of work. During the initial part of the period reinforcement was given for nearly all work responses. As the behavior began to increase in frequency, the amount of reinforcement was decreased. By the final part of this period, reinforcement was given at the end of each completed page.

Results. During the baseline period Jeff worked an average of 22% of the time when alone and 43% of the time when with the teacher. This is shown in Figure 3. Working alone varied between zero and 67% while when with the teacher ranged from 8% to 64%. At times Jeff would leave his desk to play. He did not always return when asked to do so. He complained that the work was too hard or stated that he didn't want to do it. His printing was sloppy and he was easily distracted. When teacher attention was given contingent upon work behavior in the first reinforcement period, working while alone ranged from 50% to 100% with an average of 82%. Similarly, working while with the teacher increased. It ranged from 42% to 100% with an overall average of 79%. Jeff no longer roamed around the room seeking play with other children. Stars were added in session 13. Jeff often asked if he was working quickly enough or well enough to

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Insert Figure 3 here

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merit a star. Working alone increased some 12% on the average and working while with the teacher increased 3% in comparison to the pre-star portion of the reinforcement period.

When the contingencies were reversed and returned to those of the previous baseline period, the rate of study behavior dropped. When alone, Jeff studied on the average of 58% of the time; when with the teacher, he studied an average of 44% of the time. The range for the former was 30-93%. During this period Jeff spent about half the time playing. Often he did not complete the words assigned. Those he did write were often ill formed but were still better than those written during the baseline period. Jeff was easily distractible and often asked if he could sharpen his pencil or get a drink. He spent some time "rough-housing" on the floor with Tim. During this time Jeff commented, "I think I better get to work. What am I just sitting here for? I want to earn my star." These comments, however, were not correlated with extensive work.

A period of differential reinforcement followed the reversal period. Jeff now spent 12% of his time working when alone, and 10% of his time working while with the teacher. Working alone ranged from zero to 45%, and working with the teacher ranged from zero to 39%.

The data show Jeff now spent even more time playing. Frequently he would write his name at the top of his paper and draw pictures, play "war", "rough house" or engage the teacher in irrelevant conversation.

Figure 3 also shows the effects of a return to reinforcement contingent upon working. Working alone ranged from 82-100% and averaged 90%. Working while with the teacher ranged from 79-100% and averaged 89%.

The response of Tim to the experimental operations previously described was in most ways similar to that of Jeff. Figure 4 shows

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Insert Figure 4 here

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the frequency of behavior during all periods.

During baseline, work while alone ranged from zero to 36%. It averaged 11%. Working while with the teacher ranged from 22-90% and averaged 41%. The teacher noted that his attention span was short and once distracted, he would say "good-bye," fall off the chair, and play on the floor. He frequently talked about soldier games and monsters. When he did work, his comprehension of the material was slow.

In the subsequent reinforcement period, Tim increased his working while alone to an average of 60% of the time, and while with the teacher to 76% of the time. Working alone ranged from 28-78% and working while with the teacher ranged from 55-91%. This increase is even more striking in that the scoring criterion was altered in session 17. Prior to this time any work during a 20-second interval was scored as an interval of work. From session 17 and thereafter, Tim had to study at least 10 or more seconds of each interval in order for it to be scored as work.

Stars were introduced in session 17. Because of the change in work criterion it was not possible to evaluate this effect on Tim's behavior.

During the reinforcement period Tim appeared to talk more about math than soldiers and monsters. If he left the desk he first asked permission to do so and returned promptly. He completed at least two but not more than five pages of math problems during each half-hour session.

In session 23 the contingencies were reversed to resemble those in effect during baseline. Study alone ranged from 15-68% and averaged 44%. Working while with the teacher ranged from 19-60% and averaged 38%. Although Tim's attending to work lagged there were days when he worked fairly well. At times he concentrated until Jeff had repeated his efforts to distract him. Compared to the first baseline period his work with the teacher declined only 3% while work alone increased 33%.

During the period of differential reinforcement of all behavior but work, working while alone ranged from 8-56% and averaged 25%. Working while with the teacher averaged 11% (the lowest ever) and ranged from zero to 45%. Tim did not leave his desk as much as before, but spent most of his time drawing pictures instead of doing arithmetic.

The second reinforcement period followed and showed a sharp increase in the amount of work performed. When alone, Tim worked on the average of 76% of the time with a range of 37-95%. While with the teacher he worked an average of 89% of the time. The range was from 81-100%. This is an increase of 65% over the initial baseline for working alone and 48% when working with the teacher. This is similar to the results obtained with Jeff who increased 68% over baseline (alone) and 46% (with teacher).

Tim was occasionally distracted by other activities but usually returned to work quickly. The teacher noted an increase in the quality of his work in that the number of correct answers also increased.

Low Frequency of Social Behavior

Debbie, for example, was a seven-year-old retarded girl who was extremely shy. In addition, she seldom spoke to adults or other children. Baseline observations revealed her "spontaneous" speech, i.e., speech that was not prompted by a question or command, occurred on the average of 18% of the nursery school day. A program of social reinforcement was initiated. The teacher approached Debbie whenever she talked, answered questions, and commented on her statements ("How nice.", "Aren't you smart.", etc.), patted or hugged her and stayed with her. As a result, the rate of spontaneous speech increased to an average of 28% of the day. Debbie appeared to be "happy" and the interactions with other children seemed to have also increased. The effect of the loss of teacher attention contingent upon speech was discussed previously. Thus, withdrawal of teacher attention decreased the rate of spontaneous speech from 28% to 15%.

In contrast to Debbie, the teacher may be faced with a child who has little, if any, verbal behavior which can be reinforced. In other words, the problem may not be one of low frequency of verbal behavior, but an even more serious deficit in that the child lacks many of the components of a basic verbal repertory. Sloane, Johnston, and Harris (1968) have described a series of steps leading toward functional speech. They include training in (1) simple nonverbal motor imitation, (2) imitation of placement of the vocal musculature, (3) placement of the vocal musculature with sound, (4) shaping specific imitative sounds, (5) chaining and blending of sounds, (6) tacting (naming) of objects or pictures using imitative stimuli, (7) tacting without imitative stimuli, (8) mand training in which the child obtained the reinforcer by naming it, (9) development of word chains, and (10) training in comprehension of words through multiple cues. A speech deficient child may start at any point in the series, depending upon his current skills. The following case study illustrates the application of reinforcement principles to a speech deficient child.

Carl was three-and-a-half years old, of a middle class family of Greek origin. Although both parents speak English, Greek was used in the home. Carl had a history of seizures and scored an IQ of 68 on the Peabody Picture Vocabulary Test and 93 on the Leiter International Performance Scale. Carl's verbal behavior was minimal:

he could imitate single syllables accurately but his spontaneous and non-imitative use of language was almost nil.

The first step in training was to expand Carl's imitative repertory to include multi-syllable words. The procedure involved the chaining of already existing units. A set of flash cards showing pictures of common objects was employed. The experimenter held up the card, named the object, and Carl imitated the experimenter's response. Correct responses were followed with praise and potato chips. After Carl received brief training on one-syllable words, two-syllable words were used. Below is a detailed example of the procedure.

Outline of General Procedure for Speech Training

Chaining Paradigm

Example: To train the word "table"--S imitates only one syllable at a time accurately. Capital letters enclosed in slashes indicate cues, small letters in quotes denote responses.

Stage	Procedure
1	/TA/-"ta"-Reinforcement-/BLE/-"ble"-Reinforcement
2	/TA/-"ta"-/BLE/-"ble"-Reinforcement
3	/TA/-"ta-ble"-Reinforcement
4	/TABLE-TA/-"table"-Reinforcement
5	/TABLE/-"table"-Reinforcement

Transitions between stages

1-2	As soon as S imitates accurately each syllable, drop the medial reinforcer.
2-3	Gradually lengthen the interval between the first and second syllables. S will usually make the transition himself at his own rate.
3-4	Fade in the whole word before the first syllable as soon as S consistently responds with entire word to cue of the first syllable.
4-5	Fade out the first syllable cue.

Transitions between stages 3, 4, and 5 are as fluid and non-discrete as possible. It involves gradual fading in of the whole word and fading out of the first syllable to establish the response as imitative.

Note: If transition between stages 2 and 3 is slow, use of differential hand positions corresponding to each syllable often speeds the process. Like this:

2 /TA (hand up)/-"ta"-/BLE (hand down)/-"ble"-Reinforcement
3 /TA (hand up)/-"ta"-/(hand down)/-"ble"-Reinforcement
3a /TA/-"table"-Reinforcement

The example given uses syllables as its smallest unit, but the paradigm can be easily adapted for use with units ranging in size from phonemes to phrases. The paradigm can also be used for training nonimitative responses, such as answers to questions, by making use of its nonimitative parts (stages 3 and 4). Example: /BALL/-"ball"-Reinforcement; /WHAT'S THIS-BALL/-"ball"-Reinforcement; /WHAT'S THIS/-"ball"-Reinforcement.

Training in nonimitative behavior followed. Most of the phrases used were requests or demands (mands), e.g., "I want (name of an edible)," "Stand up," "Sit down," "Blow it up," "Let it go," (referring to a balloon) and "Push it up." The consequence was given the child immediately after correct articulation. The general procedure is outlined above.

Subsequent training included the use of prepositions such as on, under, beside, and inside. Carl was told, "Put the penny (on, under, etc.) the box." Once this was done, Carl was asked, "Where is the penny?" The initial command ("Put the penny...") was trained through imitation using only the prepositions, e.g., "under" then the cue was lengthened to "under the box" and then lengthened to include the entire cue.

Modifying Some Characteristics of a Child with Down's Syndrome

One of the behaviors that identifies a child as "different" is the amount of time his mouth is open. A child with Down's Syndrome displays this behavior more often than other children. This behavior thus leads others to identify the child as retarded and often to under-evaluate the child's level of competence.

In the following case, an attempt was made to increase the frequency of mouth closing using contingent reinforcement. Donna was a five-year-old girl who had been diagnosed as having Down's Syndrome. Preliminary observation revealed she spent as much as 90% of the time with her mouth open (not talking) in contrast to a figure of 40% for other children, yet a physical examination did not reveal an unusually small mouth cavity. The procedure involved taking Donna to a small room. Two observers monitored her behavior. During baseline a teacher read stories to Donna for approximately 10 minutes while the observers recorded the percent of time Donna's mouth was closed. The average time for mouth closed during baseline was 9%. Treatment involved the teacher beginning to read the story as soon as the child closed her mouth, and interrupting the reading whenever Donna opened her mouth (including talking). As a result, mouth-closed behavior increased to average 24% of the treatment period.

Although time did not permit a complete experimental evaluation of the above procedure, the results at least suggest that environmental stimuli may play an important role in modifying behaviors often believed to be "intrinsic" to the retarded child.

Special Problems

On occasion the teacher may be confronted with a child for whom it is difficult to find reinforcers. Such was the case with Simon, a six-year-old boy with multiple behavior problems. Simon did not begin to talk until he was over three years old. He had convulsions as an infant and was believed to suffer from tuberous sclerosis. At the age of six language was developed but used haltingly. Because of his temper tantrums, aggressive behavior, and extreme disobedience, it was not possible to administer any psychological tests. In addition, Simon's attending behaviors were poor.

Simon was placed on a token-mark system similar to the one described in other sections of this report. Placement in a time-out room was contingent on tantrums, aggressive, or destructive behaviors. Although these procedures were effective in reducing some undesirable behaviors, Simon still did not cooperate well with the teacher and was sent to the time-out room almost every day. In an attempt to increase attending behavior, the following procedure was used:

A card with the numbers 0, 1, 2, 3, 4, and 5 was set before Simon on the table. _E_ would say, "Point to the zero," or "Point to the three," and so forth. Each time Simon responded correctly (by pointing to the number _E_ had just instructed him to point to) on his first attempt _and_ _E_ had not repeated the cue, Simon was given a mark on a sheet of paper (and occasionally a bit of his lunch). This sheet of paper was divided into 25 squares and when completely filled, permitted him to return to the classroom to finish eating and "be with the other children."

The order of presentation of stimuli followed the number series (first 0, then 1, then 2, etc.) only if Simon responded correctly on his first try. If he made an error, or if E repeated the cue before the correct response finally occurred, the next cue would be that one in the natural number series immediately preceding the one on which the error had been made. In other words, a back-up procedure following errors was used and Simon could not "go on" until he had answered correctly on his first try. If Simon pointed to the wrong number, E would drop his head, withdrawing his attention until the correct response occurred. Sometimes E would repeat the cue if Simon's attention seemed to wander or his response latency was especially great. In this case, as in the case of error occurrence, the response which eventually terminated the trial (i.e., the correct response, but not on the first try) was followed not by a mark, not by a verbal "Good!", and not by a bit of food, but by a flat "That's right." Because of the clarity of this explanation of procedure, following is an illustrative sample protocol:

E: Point to the one.
S: (points to the one)
E: Good! (gives mark) Point to the two.
S: (points to the five)
E: (initiates time-out)
S: (points to the five again)
E: Point to the two.
S: (points to the two)
E: That's right. Point to the one.
S: (points to the one)
E: Good! (gives mark) Point to the two.
S: (points to the two)
E: Very good! (gives mark and bit of food)

Following the use of this procedure the amount of time it took Simon to make 25 correct responses on the first try decreased markedly. The sequence of times was 24 minutes, 21 minutes, 12 minutes, 9 minutes, 6 minutes, 9 minutes, 6 minutes, and 5 minutes for the first eight sessions. During the next 12 sessions time ranged between 3 and 6 minutes.

A somewhat different procedure was used in the classroom when Simon was to work on reading, writing, and arithmetic. Initially, Simon was required to make only two or three correct responses on the academic materials. Then he was given marks, a special privilege, or allowed to go out and play. Sometimes the correct responses would take only 30 seconds. If Simon refused to work, the teacher turned away from him for a brief period. Subsequently the required number of responses was gradually increased, as was the frequency of the academic periods (to several times a day). Although his responses were still somewhat inconsistent, it was possible over a three-month period to get as many as 15 correct responses in a single academic period.

8. Work with Parents

Perhaps the most basic reason for involving the parents in a nursery school program is based on the assumption that stimuli which make up the child's natural environment determine the development and maintenance of the behavior (and personality) of the child. Since parents compose the most influential part of the child's natural environment, it is likely that their behaviors serve a variety of stimulus functions, controlling both reflex and operant behaviors. If the child's behaviors are considered to be in some way deviant, his parents may be the source of stimuli and reinforcers which may have produced and are maintaining the deviant behavior. (This is stated without blaming and without implying "conscious motivation".) Thus parents may become involved when (1) the child is exhibiting a problem at home, (2) when the problem is displayed both at home and in the classroom, and (3) when parental interaction with the child interferes with or does not support the remedial procedures in the classroom. It should be obvious that behaviors which are modified in the classroom without alteration in the parents' behavior, are more likely to reappear when the child is permanently removed from the class. Furthermore, treatment in other settings (e.g., the home) is likely to facilitate generalizing the treatment effects from one setting to another or from one person to another.

Behavior can be modified most effectively when the problem behaviors can be observed first hand. This, of course, means that the worker should, when possible, observe the interactions between parent and child wherever the problem behaviors occur. These observations would often take place in the child's home. Such a procedure has certain advantages. First, the home is the natural setting for parent-child interactions. Behaviors of concern to both the professional worker and the parent are not only more likely to be displayed in the residential setting, but in some cases this may be the only setting in which the problem behavior is displayed. Only through direct observation can the worker accurately assess the contingencies of reinforcement between parent and child. It should be obvious that this type of information cannot be obtained through current psychometric procedures and may not be accurately described in the parents' account of the problem.

The presence of a worker in the child's home raises certain difficulties, however. Any observer no doubt will change the stimulus properties of that setting to some degree, and may disrupt some of the usual behavior patterns of parent and child. This disruption can be minimized, however, if the observer studiously avoids any interaction with either parent or child while he is in the home assessing the problem. If this procedure is explained beforehand, it is not difficult to obtain parental cooperation in such matters. Usually, after a few visits both parent and child will minimize reacting to the observer's presence and often appear to behave as if he were not there. It may be argued that the observer still provides an element of distortion in the parent-child interaction, and of course, this is true. However, this distortion should be weighed against the alternative of bringing the child and parent to the laboratory or clinic. It seems likely that one will see a more natural interaction in the home with an observer than in another setting which does not at all resemble the child's natural environment.

In most cases, however, it may be helpful to have the parent observe the child in the classroom. The parent may then observe procedures for dealing with problem behaviors and in some instances, replace the teacher in order to obtain first-hand supervised experience with the techniques practiced.

The parent-teacher approach suggested here attempts to arrange conditions so that the parent will give maximum support to the school program. Techniques similar to those described in the chapter on behavior modification are, of course, used. Basically, the teacher must instruct the parent (usually the mother) in some new but very specific ways of interacting with her child. In some cases the teacher or worker may demonstrate a procedure and then supervise the parent in its use.

Simply telling the mother what to do may result in failure because she does not respond to the child at the appropriate time, for the correct behavior, or with the correct response. Just as the child needs a system of differential consequences applied to his behavior, so does the parent. Thus the chain is--parent reacts to child, teacher reacts to parent, and hopefully, changes in the child's behavior maintain the parents' newly acquired responses.

Treatment of problem behaviors in the home can be combined with experimental research. An investigator may study the effectiveness of certain clinical procedures or any of a number of variables which influence parent-child interactions. This means that the home is also serving as a behavioral laboratory. Considering it as a laboratory, the home certainly lacks some of the aspects of control usually found in an experimental research setting. Thus, the phone may ring, a salesman may appear, a neighbor may visit--all at the "wrong time" from the investigator's point of view. These problems can usually be controlled if the parent is instructed how to handle them beforehand. One may note, however, that the occurrence of uncontrolled events may actually prove valuable especially when they suggest important but previously unconsidered variables relevant to the research problem under study. It should be obvious that when compared to the home, all other laboratories for the study of mother-child interaction will be impoverished with regard to the types of stimuli which influence the behavior of parent and child. The study of such stimuli may be impossible in other settings simply because the stimuli have yet to be isolated and defined. Even when definition has been accomplished it may be difficult to reproduce or manipulate certain stimuli in an artificial laboratory.

Take amount of sleep, for example. This variable may function as a setting event for a host of behaviors. A possible effect of such a variable was recently noted in a four-year-old boy who exhibited a variety of undesirable behaviors including head-banging, biting, throwing, and crying. Although these responses were primarily controlled by certain responses on the part of the child's mother, their frequency did vary from day to day. Some of the variation appeared to be correlated with the number of hours of sleep allowed the child. When the child was put to bed early, the deviant behaviors declined somewhat; when he was put to bed late, the deviant behaviors increased. Although other conditions might of course be correlated with the change in undesirable responses, the number of hours in bed appeared to be a variable worthy of additional study.

In further considering the home as a laboratory, one is soon brought to the question of what data to record and how to record it. Regardless of the type of technique used, it may be wise to delay data gathering until both parent and child have become accustomed to the presence of an observer. Such a procedure may reduce or eliminate the recording of extremely variable data.

Recording techniques involve defining behaviors of interest on the basis of the topography of the response. The total period of observation is then divided into small time units and responses are recorded as either present or absent in each time unit. Actually the research technique in the home is the same as used in the school, but adjusted to the special circumstances.

The following case illustrates some procedures used in dealing with an eating problem in the child's home.

The child, Carl, was a four-year-old boy who exhibited delayed speech, was not completely toilet trained, and misbehaved while eating. The worker treated the eating problem first because it was a particular source of irritation to the mother and was of such a nature that it provided the mother with a simple demonstration of behavioral techniques.

The problem was dawdling at lunch time: the child took from 22 to 42 minutes to eat a small bowl of food. He most often ate with his fingers. Frequently he got up from his chair or laid down on the seat. He also brought toys to the table and played with them while eating. In addition he teased or hit his younger brother who was seated near him. During this time the child's mother was in the kitchen but would occasionally come in to reprimand Carl for hitting, or nag him to eat faster. She seldom praised him for correct responses.

Procedure

Lunch time was divided into a series of 20-second intervals. The presence or absence of any of the following behaviors was noted in each interval.

P - Posture deviant. S's buttocks not touching the chair; head turned away from the table more than 90°, eye level below table top.

F - Fingers food (except to put on spoon)

O - Touches object other than chair, table, dish, spoon, napkin, and glass. Includes touching brother.

S - Uses spoon to move food from bowl to mouth.

Three deviant (P, F, and O) and one appropriate (S) forms of behavior were observed and recorded for eight sessions by two observers to obtain data on baseline performances.

In treatment period A, the mother was instructed to ignore all deviant behaviors and to praise appropriate spoon feeding upon hearing a signal from the worker. A second signal indicated that she was to remove a toy from the table. A third signal indicated that Carl had hit his brother and that the mother was to terminate the session and put him to bed. In addition, the mother was to start a kitchen timer and allow the child to have dessert if he finished eating within 25 minutes. A detailed set of instructions may be seen in Table 1.

Table 1

Eating Behavior

Instructions to the mother for experimental period A

1. Do not call the boys to the table until the food is ready to set before them. Have something that should be eaten with a spoon. Do not have any finger foods. Also, have a dessert ready every day.

2. When the boys are seated, give them their food. Say to S, "I want you to eat everything with your spoon. Try to finish before the bell rings. (At first show him how the timer works.) If you eat nicely and finish on time you may have some dessert. Go ahead." Now, set the timer for 25 minutes. Have the timer on the table where S can see it, but make sure it is out of his reach.

3. Now go about your business, but remain in the kitchen. It is essential that you stay in the kitchen. Do not say anything else to S, except as indicated below. You may interact normally with the brother.

4. Occasionally the observer will tap his pen once on his or her clipboard. When this happens, go to S and say something like, "You're eating very nicely, good boy." This is the only time you are to pay any attention or speak to S. Ignore him at all times except when the observer taps his pen.

5. Do not have any objects on the table that S can manipulate, other than his spoon, glass, dish, and napkin. If S goes to get something to play with at the table, the observer will tap his pen twice. When this happens, take the object away from S, but do not speak to him--just take the object out of his hands very calmly, without a word, and go back to your business about the kitchen.

6. If S finishes before the bell rings, praise him enthusiastically, shut off the timer, and give him his dessert. If the bell rings before S is finished, take his plate away and put him down for his nap. Do not scold him for not finishing. Be very matter-of-fact. Say something like, "The bell rang and you aren't finished so you have to go take your nap now." Then remove his plate and send him to the bathroom. Ignore any requests for dessert. If he has a tantrum, put him in bed and shut the door without saying anything.

7. S is never to have any kind of between-meal snack between lunch and dinner except what he gets at school. Under no circumstances give him anything to eat between these two meals.

8. If S hits or pinches his brother, he is to be put to bed immediately. Do not scold, but be very matter-of-fact as in number 6 above. Without saying a word, take him to his room, ignoring any protests. The signal from the observer for this procedure will be three taps of the pen.

Five days later the procedure was modified, constituting treatment period B. Mother was still instructed to ignore deviant behavior with the exception that if Carl left his seat he was to be returned to it with a minimum of social interaction. Signals from the worker were no longer employed. Instead, the mother sat at the table and put a spoonful of dessert on an empty plate every time Carl used the spoon appropriately. He was also praised for this behavior. If he finished eating at the end of ten minutes he was allowed to eat the dessert he had earned. If he finished before the end of the 10-minute period, he was given the entire dessert. This procedure was in effect for 15 sessions, the last three of which the mother did not sit at the table, but delivered intermittent praise for correct eating.

Figure 5 shows the changes in behavior from baseline through treatment periods A and B for spoon feeding, and Figure 6 for deviant behavior. In each figure the same data are plotted two ways. In the upper section it shows the changes and trends in discrete form, in the lower section in cumulative form. During baseline there was little appropriate spoon feeding and considerable deviant behavior. Little change was noted during treatment period A. The child was sent to bed several times for hitting during this period. Deviant behaviors declined in strength with the beginning of period B and then rose slightly. The overall frequency was less than half of the baseline period and treatment period A. Although spoon feeding showed an initial increase during treatment period B, it then leveled off before rising to near

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Insert Figure 6 here

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maximum frequency. By session 9 Carl was eating all of his lunch.

Prior to this attempt to modify eating behavior, the worker conferred with the mother on the child's toilet training. It soon became apparent that instructions without supervision and guidance in the home would not work. Thus the worker decided to work with the mother in the setting where the child displayed the problem, which allowed him to give the mother direct feedback on his behavior.

The behavior modification procedures used in this case certainly contrasts with traditional approaches to behavior or emotional problems. Traditionally, the unmanageable child is encouraged to express his feelings in play or other types of interpretive psychotherapy. At the same time the parents may be taken into a treatment which is typically directed toward understanding the origin of the child's problem, their own reactions to the child, their own parents, to each other, and possibly toward the therapist himself. The difficulty with this approach is that the therapeutic efforts may be only vaguely and indirectly related to actually changing the manner in which the parent responds to particular behaviors displayed by the child. It should be apparent that behavior modification procedures applied to the parent situation aim to eliminate parental support for undesirable behavior and arrange conditions which establish and maintain acceptable behavior.

The following study by Zeilberger, Sampen, and Sloane (1968) provides an excellent example.

Rorey was a four-year-old boy with many objectionable behaviors including screaming, fighting, disobeying, and bossing. Eight months later these behaviors had declined to an acceptable level in the preschool but were still observed at home.

Observation suggested that the mother reinforced undesirable behavior by attending to it. Subsequently, observers were sent into the home to record the child's behavior. The code was as follows:

A. Physical aggression: hitting, pushing, kicking, throwing, biting, scratching. Recorded only while the subject was in his own yard or house.

Y. Yelling: Recorded only while the subject was in his own yard or house.

B. Bossing: Directing another child or adult to do or not to do something. Recorded only while the subject was in his own yard or house.

I. Any instruction given to Rorey by his mother. To be coded as an instruction, the statement had to include Rorey's name, and a command that he do or stop doing some specific action. Each different kind of instruction was assigned an arbitrary time interval the first time it occurred. Compliance with the instruction within this interval (which remained the same throughout the study) was coded as obeying by circling the symbol; if Rorey did not comply within this interval it was coded as disobedience by being left uncircled. All instructions given by Mrs. B. were recorded whether the subject was at the neighbors or at home.

Recording procedures were similar to those previously described. During baseline the observers noted the frequency of those behaviors in the code. During the first experimental period the mother was given a set of instructions which were:

1. Immediately after Rorey acts aggressively or disobediently, take him to the time-out (TO) room. One of the family bedrooms was modified for this use by having toys and other items of interest to a child removed.
2. As Rorey is taken to the TO room for aggressive behavior, say "you cannot stay here if you fight." As Rorey is taken to the TO room for disobedient behavior, say, "you cannot stay here if you do not do what you are told." Make no other comments.
3. Place Rorey in the TO room swiftly and without conversation other than the above. Place him inside and shut and hook the door.
4. Leave Rorey in the TO room for 2 min. If he tantrums or cries, time the 2 min. from the end of the last tantrum or cry.
5. When the time is up take Rorey out of the TO room and back to his regular activities without further comment on the episode, i.e., in a matter-of-fact manner.
6. Do not give Rorey explanations of the program, of what you do, of his behavior, or engage in discussions of these topics with him. If you desire to do this, have such discussions at times when the undesired behaviors have not occurred, such as later in the evening. Keep these brief and at a minimum.
7. Ignore undesirable behavior which does not merit going to the TO room. "Ignore" means you should not comment upon such behavior, nor attend to it by suddenly looking around when it occurs.

8. Ignore aggressive or disobedient behavior which you find out about in retrospect. If you are present, treat disobedient behavior to other adults the same as disobedient behavior to you.

9. Reinforce desirable cooperative play frequently (at least once every 5 min.) without interrupting it. Comments, such as "my, you're all having a good time" are sufficient, although direct praise which does not interrupt the play is acceptable.

10. Always reward Rorey when he obeys.

11. Special treats, such as cold drinks, cookies, or new toys or activities, should be brought out after periods of desirable play. It is always tempting to introduce such activities at times when they will interrupt undesirable play, but in the long run this strengthens the undesired behavior.

12. Follow the program 24 hrs. a day.

The experimental period was followed by a second baseline and a second experimental period. Figure 7 shows the changes following

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Insert Figure 7 here

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instructions with each change in procedure. The average rate was 30% in the first baseline, 78% in the first experimental period, 40% in the second baseline, and rose to 78% during the second experimental period.

Figure 8 shows changes in aggressive behavior during the study.

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Insert Figure 8 here

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Aggressive behaviors are highest during the baseline period and lowest during the experimental periods. The length and frequency of time-out declined sharply toward the latter part of both experimental periods.

It seems clear that Rorey's aggressive and disobedient behaviors were changed by altering the consequences of those behaviors. More importantly, however, both mother and child were treated together. The authors reported that the mother was able to see after the treatment had begun, how her behaviors affected those of the child. Thus the treatment may not only have eliminated the present problem, but by increasing the mother's skills, prevented the occurrence of future difficulties.

9. The Teacher Training Program

The training of teachers of exceptional children in the application of the experimental analysis of behavior is no different in principle from the training of children in the classroom. Basically the same principles and techniques apply with perhaps a stronger emphasis on a verbal and conceptual analysis of behavior problems. This analysis covers basic principles of reinforcement, discrimination, generalization, abstraction, and chaining, along with basic measures of response strength and consideration of functional explanations of behavior. Such training is usually carried out in seminars, using lectures, example problems, films, and texts. The following books and films may be recommended for such training.

Books

Holland, J. G. and Skinner, B. F. The analysis of behavior. New York: McGraw-Hill, 1961.

Ferster, C. B. and Perrott, Mary. Behavior Principles. New York: Appleton-Century-Crofts, 1968.

Millenson, J. R. Principles of Behavior Analysis. New York: MacMillan, 1967.

Ullmann, L. and Krasner, L. Case studies in behavior modification. New York: Holt, Rinehart, & Winston, 1965.

Sloane, H. N. and MacAulay, Barbara. Operant procedures in remedial speech and language training. New York: Houghton Mifflin, 1968.

Bijou, S. W. and Baer, D. M. Child development: A systematic and empirical theory. Vol. I., New York: Appleton-Century-Crofts, 1961.

Smith, Judith and Smith, D. Child Management. Ann Arbor: Ann Arbor Publishers, 1966.

Films

Behavior Theory in Practice. New York: Appleton-Century-Crofts, 1965.

Reinforcement Therapy. Philadelphia: Smith-Kline-French, 1966.

Operation: Behavior Modification. Chamblee, Georgia: U. S. Public Health Service, 1968.

Perhaps even more important than seminars in the training of teachers is planned involvement in reinforcement contingencies. Thus the teacher should spend several weeks learning to control the behavior of laboratory organisms by participating in exercises which illustrate basic principles of behavior. Central to this experience is an awareness of how the teacher's behavior influences the behavior of infra-human organisms.

Subsequently (or simultaneously) the teacher should become involved in classroom activities with young children. The teacher is observed with regard to her specific interaction with a particular child and is given feedback on the effectiveness of her behavior and alternative ways of handling the child. The feedback is usually provided through an intercom or other communication system.

Since observation and the recording of data play an important role in the modification of behavior, the teacher is instructed in the use of recording devices such as hand counters and interval recording sheets. She learns to organize and analyze the data in such a way that current procedures, techniques, or programs may be carefully evaluated and quickly modified when necessary.

In order to make the necessary modifications, instruction is also given in finding appropriate reinforcers, scheduling their applications and the arrangement and management of reinforcement contingencies. This means that the teacher must begin to develop skill in the analysis of behavioral problems and the determination of terminal behaviors.

Utilizing these skills the teacher also gains experience in the development of academic programs and the preparation of remedial sets. This involves an analysis of behavioral units, programming or sequencing materials and stimulus control of behavior through fading techniques. In addition the teacher must learn to judge the appropriate size of each step in the program and learn when the program may be compressed to increase learning speed or when to expand the program to decrease errors.

Finally, the teachers must learn how to apply behavioral principles and techniques to the training of other nursery school staff such as tutors and observers. She must be able to set up terminal behaviors in each case and develop or employ procedures designed to produce the appropriate behavior in staff members. Moreover the teacher should also utilize her behavioral skills and knowledge in dealing with parents. Thus instead of generally counseling the parent with regard to the feelings of child and parent, the teacher should be able to train the parent and develop home programs designed to maintain desirable behaviors exhibited by the child in nursery school or assist in remediating problem behaviors displayed in the home.

In summary the teacher training aspect of the program should develop the following terminal behaviors:

1. Skill in conceptualizing, observing, and recording behavior and the organization and analysis of data.
2. Awareness of the effects of teacher behavior on the child's behavior.
3. Competence in finding, arranging, scheduling, and modifying reinforcement contingencies.
4. Proficiency in the analysis of behavior problems and the determination of terminal behaviors.
5. Competence in the development of academic programs and the construction of remedial programs where necessary.
6. Proficiency in the application of behavioral principles and techniques to the training of parents and other nursery school staff.

Thus, with the behavior of the child as the ultimate indication of a teacher's effectiveness, the teacher takes full responsibility for the progress of the child. She cannot lean on hypothetical entities to explain the child's behavior or excuse his failure to learn. She must, instead, look toward environmental stimuli and the principles of behavior analysis for solutions to difficult problems.

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11. Publications

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Other publications will follow. They will be based on segments of this report and will contain all the necessary details and elaborations in the form of graphs and tables.

Appendix A

Samples of Analyses, Programs, and Outcomes During the First Year (1964-65)

History

Cindy was 3 years and 6 months old at the beginning of the year, the third child of older parents, with two normal older brothers. There is no history of trauma, illness or unusual prenatal or perinatal background. When evaluated at a pediatric clinic in 1962 she was diagnosed as developmentally retarded, etiology unknown. Stanford-Binet and Cattell Infant Intelligence tests administered in July 1964 indicated that she had a mental age of 18 months with an estimated IQ of 45. She was described as extremely dependent with no speech.

Behavior at the Beginning of the Year

(1) Speech: Almost no speech sounds and no words, with communication limited to a generalized "uh-uh" used to get attention, express her wants, and resist adult demands.

(2) Motor Coordination: Very immature physical development and coordination: unable to go up or down steps, ride a tricycle, jump, walk on wide boards or climb. Walked with a wide, tottering gait, arms held out for balance. She was unable to take off or put on her own clothing, or perform any routine self-help tasks.

(3) Dependent Behavior: Extremely dependent in all areas of her behavior, expecting constant help from adults, whining, crying, and finally tantruming when such help was not immediately given.

(4) Toilet Training: Some toilet training established but not self-initiated, with frequent refusals to perform when taken to the bathroom.

Desired Terminal Behavior

(1) Speech: Establish a wide variety of verbal sounds and babbling. Develop repertory of simple words, tacts and self-report mands.

(2) Motor Coordination: Improved motor coordination enabling Cindy to handle steps without supervision, and use the outdoor equipment at the level of at least a 2½-year-old child.

(3) Dependent Behavior: To establish independence in self-help activities in initiating her own play.

(4) Toilet Training: The establishment of reliable self-initiated toileting habits.

Procedures

(1) Individual speech sessions in the laboratory were held every day, and all vocal sounds and babbling were reinforced in the classroom.
(2) A planned program of teaching Cindy basic motor skills was carried on throughout the year. This included teaching her to go up and down steps, walk on boards at progressively higher distances from the ground, climb a simple climber and to ride a tricycle. These skills were taught in small sequential steps, and each successful execution of these steps was reinforced.
(3) Cindy was taught how to take care of her wraps, wash her hands, and push her own chair up to the table. As she learned these skills, teachers withdrew their help and gave her social reinforcement for her independent actions.
(4) Using the toilet at school was regularly encouraged and sitting on the toilet was reinforced.

Reinforcement and Maintenance of Motivation

(1) Reinforcers such as M & M candies and bits of chocolate bars were used in the classroom.
(2) Token reinforcement was used in the speech sessions, with trinkets being given in exchange for tokens earned in the session.
(3) Social reinforcement was used in both the classroom and speech sessions.

Generalization and Maintenance of Behavior

(1) Social reinforcement and teacher attention was given for all independent purposeful behavior in the classroom and for all attempts at verbalization. As substitute sounds for "uh-uh" were developed, teachers gradually reduced the number of times that they responded to non-verbal communication.
(2) A program of teaching Cindy's parents to work with her speech at home, handle her dependency more effectively, and manage toileting and bedtime routines was undertaken.

Current Status of Cindy's Behavior

(1) Speech: There has been a steady increase in the number of verbal sounds that Cindy can make and in her rate of using them during the school sessions. At the beginning

of the year an average of only 5 verbal sounds per day were recorded and her rate of emitting "uh-uh" to communicate averaged 65 incidents during each session. During spring quarter the rate of verbal sounds had reached an average rate of 90 per day.

Cindy now has about 20 verbal sounds that are associated with specific objects or events and used consistently both at home and at school. Some of these are clearly distinguishable as words, but in most instances they are approximations to words, such as "ba" for ball, "a pa" for apple, etc. She now substitutes an appropriate verbal sound for "uh-uh" when this is not responded to and uses these sounds to express her wants or contact others.

(2) Motor Coordination: Cindy can now go up and down three or four steps without supervision, and in an upright position. She walks across an eight-inch board elevated to 2 feet off the ground, climbs three rungs on a ladder climber, uses a sliding board with confidence, and has learned to ride a tricycle. Her posture and gait now more nearly approximate that of a 3-year-old child and she now walks and runs without having to hold her arms out for balance.

(3) Independent Behavior: Self-help skills are well established and independent self-initiated activity has greatly increased. Cindy is now purposeful and persevering in her work with materials, having an effective work span of 10 to 20 minutes for one activity.

(4) Toilet Training: Cindy uses the toilet at school when given the opportunity to do so and has occasionally indicated her need to go to the bathroom. Some problems with toilet training at home remain and complete independence of adult help in this area has not yet been achieved.

Current Status of Parent Training Program

Work with Cindy's parents was slow during the first part of the year by their inability to accept the reality of their child's deviant development, their inability to say "no" to Cindy, and their failure to expect her to act independently. A program to help the parents learn to say "no" was instituted during winter quarter, using one specific problem as a focus of learning. Before spring vacation an attempt was made to teach the mother to carry on speech sessions at home. Suggested programs for handling toileting and bedtime problems have also been worked out with the parents.

Progress in teaching the parents to gain some control over Cindy's behavior has been made and they can sometimes say "no" to her. The mother succeeded fairly well with speech work at home for a time but later became discouraged and resistant about carrying on this project. Cooperation in following through on more effective ways of handling bedtime and toileting has been inconsistent. Motivating the parents to learn different techniques for handling Cindy's behavior problems at home has not yet been achieved.

Appendix B

Sample of Analyses, Programs, and Outcomes During the Second Year (1965-66)

History

Mark was 6 years 3 months at the time of enrollment. He had been referred for a psychological examination by the public school in which he was enrolled because of "disturbing emotional behavior." This consisted of screaming, fighting, lack of attention, and hyperactivity. In September 1965 he repeated kindergarten. His IQ on an unspecified test was 75. His school attendance was poor, missing two or three days a week.

His parents were separated and he lived with his mother and two younger sisters. He had had a series of babysitters including his great grandmother. His mother believed that all the babysitters had been far too permissive with him. She was strict and used punishment frequently.

Behaviors at the Beginning of the Year

(1) Screaming, shouting, and crying. This behavior occurred when there was no apparent cause, when he did not get his way, when he was asked to do something, or when he was praised for doing something. It occurred about 10% of the time.

(2) Baby Talk. This he used spontaneously and as a mimic of the younger wordless children.

(3) Thumbsucking. During periods of quiet play and during group activities. When Mark did not get what he wanted, he put his thumb or fingers in his mouth.

(4) Fighting. Mark would fight for possessions, kicking, biting, and scratching other children. He was not usually the aggressor unless something was taken from him.

(5) Pre-academic Skills. He knew some shapes by name and he could match shapes. He knew the names of 8 colors and could match them. He could read his name and write MRK, and count to 20, but did not recognize numerals above 3. He would make an attempt to write 1, 2, 3.

Desired Terminal Behavior

(1) Elimination of screaming, shouting, and crying in classroom

activities, with more leniency shown while engaging in outside play.

(2) Elimination of baby talk.

(3) Elimination of thumbsucking and fingers in the mouth.

(4) Reduce or extinguish fighting and possessive behavior and replace them with longer periods of constructive activities.

(5) Name up to 8 shapes. Read names of all the children. Write his own name. Recognize numerals to 10. Write numerals to 10. Do addition to 10.

Procedures

(1) Screaming, shouting, and crying were put on a schedule which reinforced longer durations of other behaviors. The program was used only during part of the day in the hope that generalization would take place.

(2) Baby talk was treated with withdrawal of teacher's attention. Appropriate speech was intermittently reinforced.

(3) Thumbsucking and fingers in the mouth were consistently treated with withdrawal of teacher's attention.

(4) Teachers gave verbal instructions to stop fighting and removed him from the situation if there was danger of hurting someone. More organized activities were introduced.

(5) Various experimental programs were used in individual settings and in group activities, with a time set aside every day for the completion of a set amount of work. Informal introduction of things learned in stories and play situations.

Reinforcement and Maintenance of Motivation

(1) Candies and pennies were used for periods without screaming, with longer and longer periods elapsing before reinforcement.

(2) Progress sheets to be colored in by child at completion of task, and stars were given for preacademic work.

Generalization and Maintenance of Desired Behaviors

(1) Social reinforcement was given for quiet play, and for work with the hands which competes effectively with thumbsucking.

(2) Social reinforcement and marks were given for preacademic work.

Current Status of Behavior

(1) Screaming appears only in 2% of the daily records and he can discriminate his screaming behavior.

(2) Baby talk has almost disappeared. When the teacher's attention is withdrawn he immediately changes to normal speech.

(3) Thumbsucking and fingers in the mouth have been eliminated except during story time.

(4) With an increase in interesting organized activity, fighting has decreased to 1% of the time, with no fighting on most days.

(5) He can name 8 shapes, match them, and draw 6 of them; read the names of all the children in his class; write his own name; name 10 letters; recognize numerals to 10; count to 20; write numerals to 10; and do additions to 8.

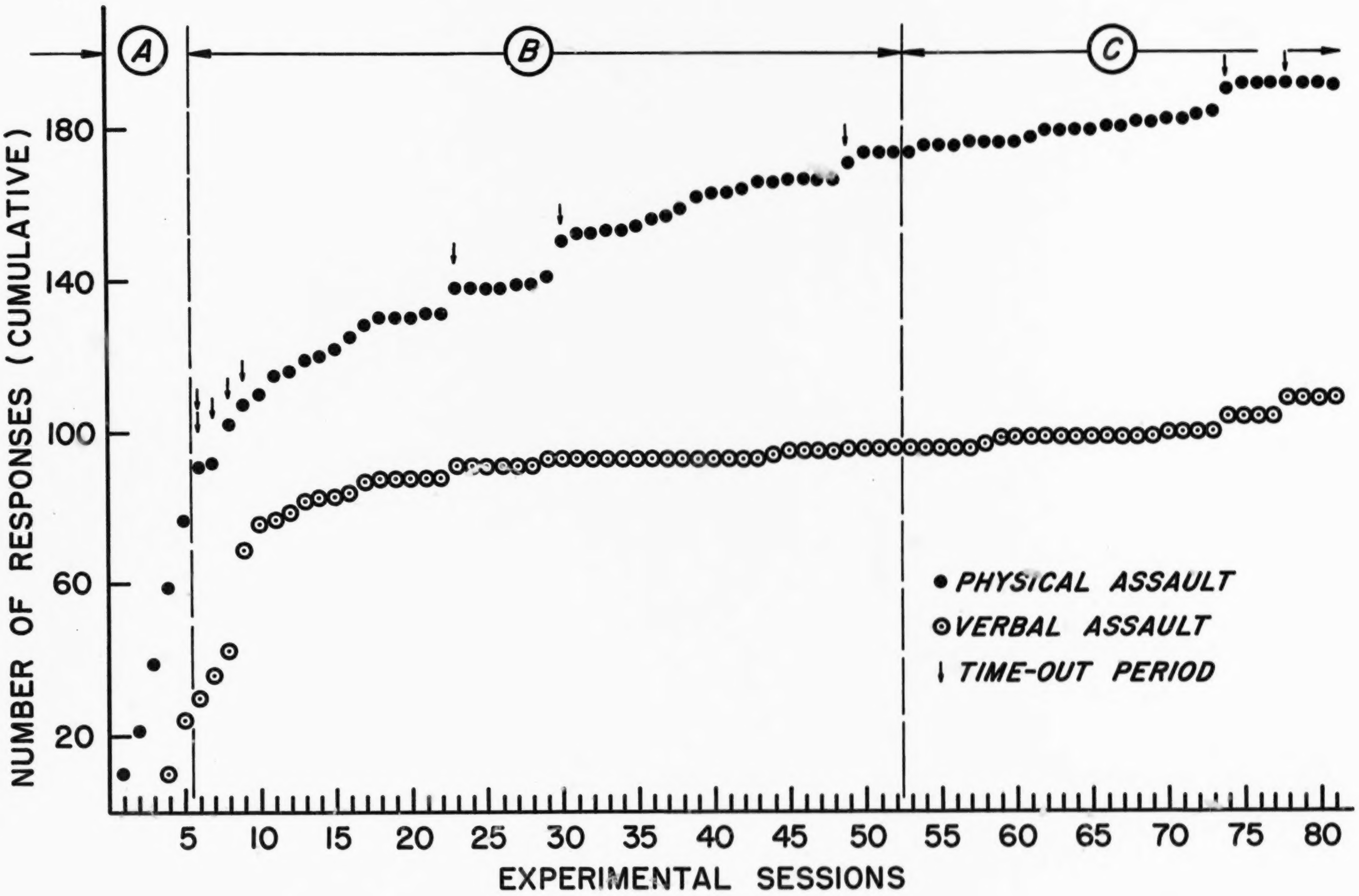
A
B
C
NUMBER OF RESPONSES (CUMULATIVE)
20
60
100
140
180
EXPERIMENTAL SESSIONS
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
● PHYSICAL ASSAULT
⊙ VERBAL ASSAULT
↓ TIME-OUT PERIOD

Figure 1

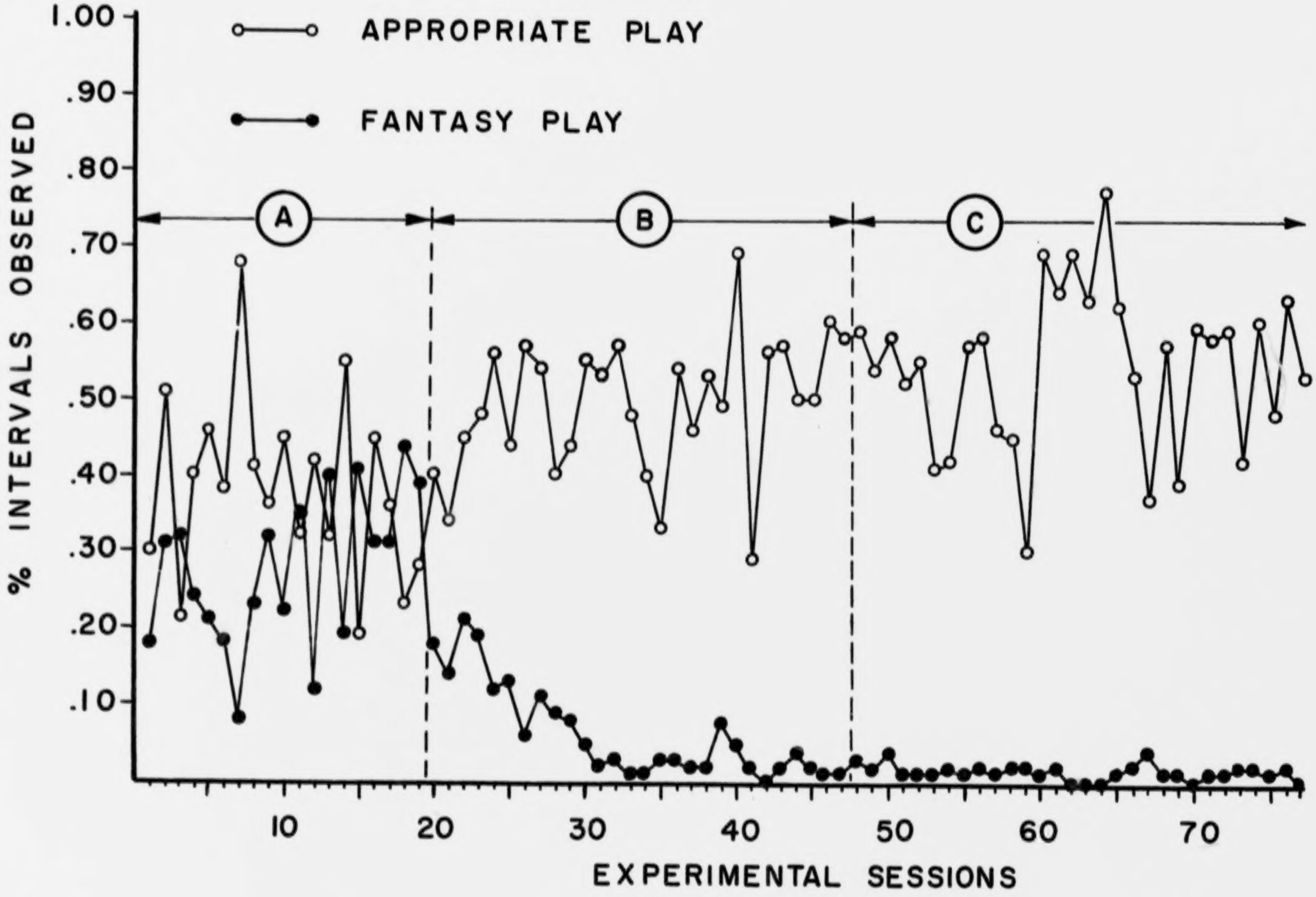
APPROPRIATE PLAY
FANTASY PLAY
A
B
C
1.00
.90
.80
.70
.60
.50
.40
.30
.20
.10
% INTERVALS OBSERVED
10
20
30
40
50
60
70
EXPERIMENTAL SESSIONS

Figure 2

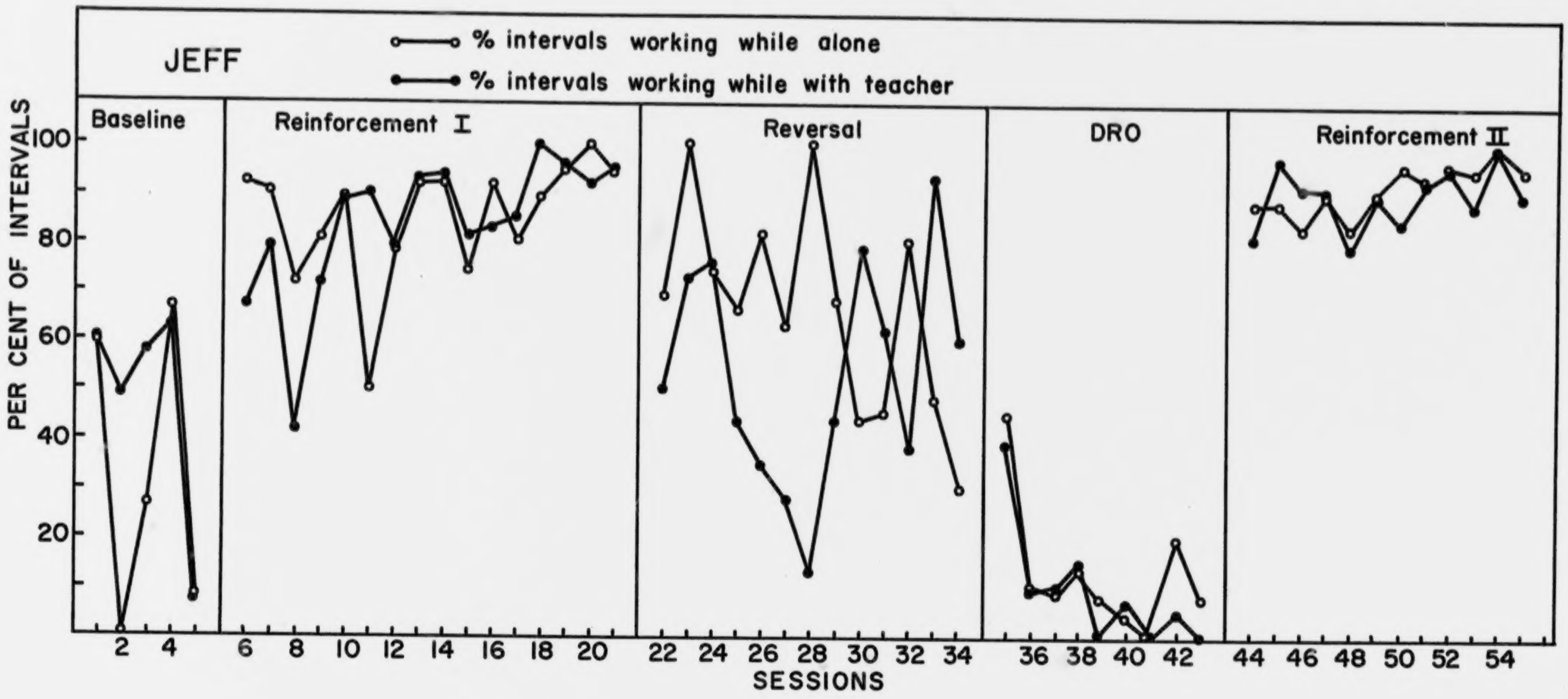
JEFF
% intervals working while alone
% intervals working while with teacher
Baseline
Reinforcement I
Reversal
DRO
Reinforcement II
PER CENT OF INTERVALS
100
80
60
40
20
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
54
SESSIONS

Figure 3

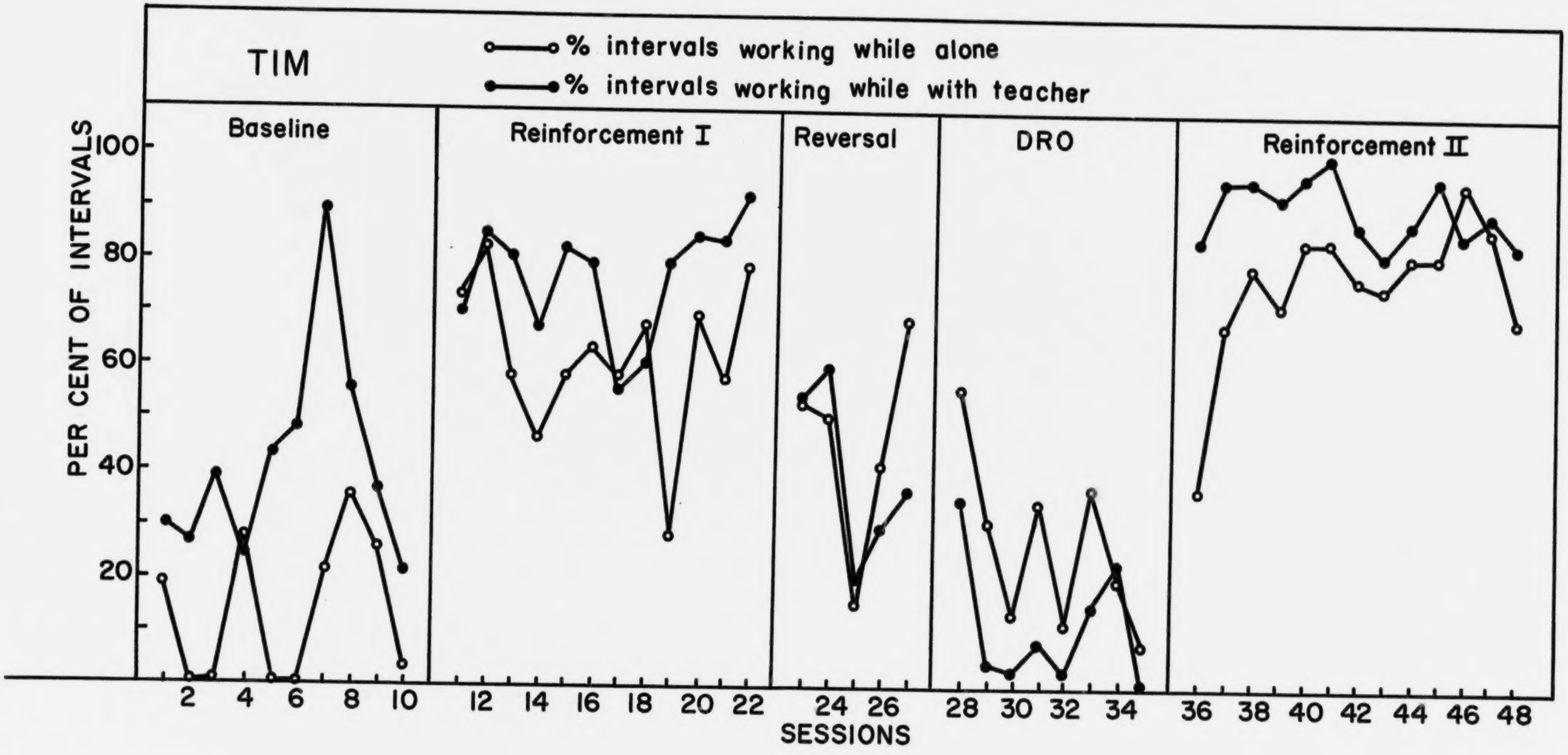TIM
% intervals working while alone
% intervals working while with teacher
Baseline
Reinforcement I
Reversal
DRO
Reinforcement II
PER CENT OF INTERVALS
100
80
60
40
20
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
SESSIONS

Figure 4

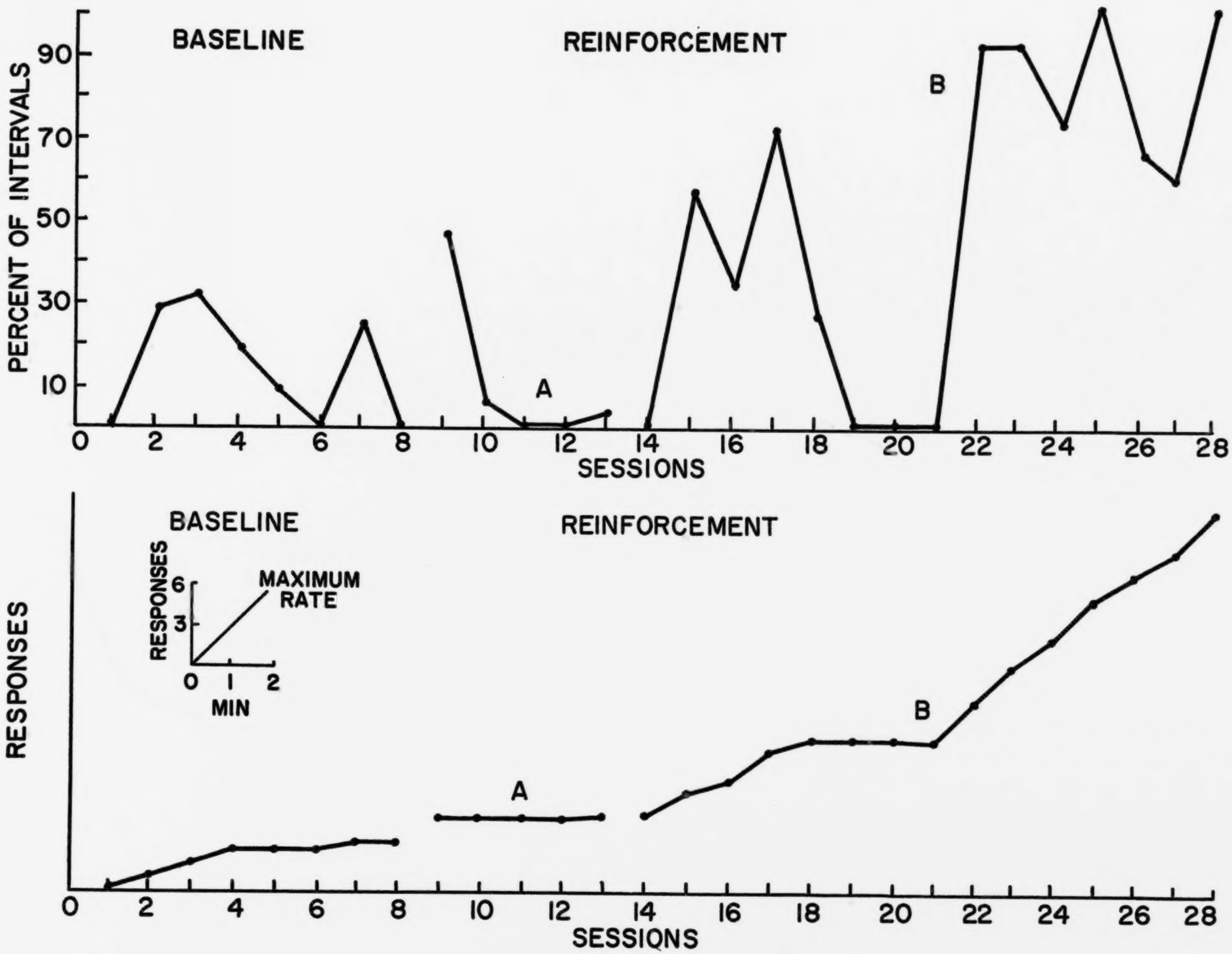
BASELINE
REINFORCEMENT
PERCENT OF INTERVALS
90
70
50
30
10
A
B
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
SESSIONS
BASELINE
REINFORCEMENT
RESPONSES
RESPONSES
6
3
0
1
2
MIN
MAXIMUM RATE
A
B
SESSIONS

Figure 5

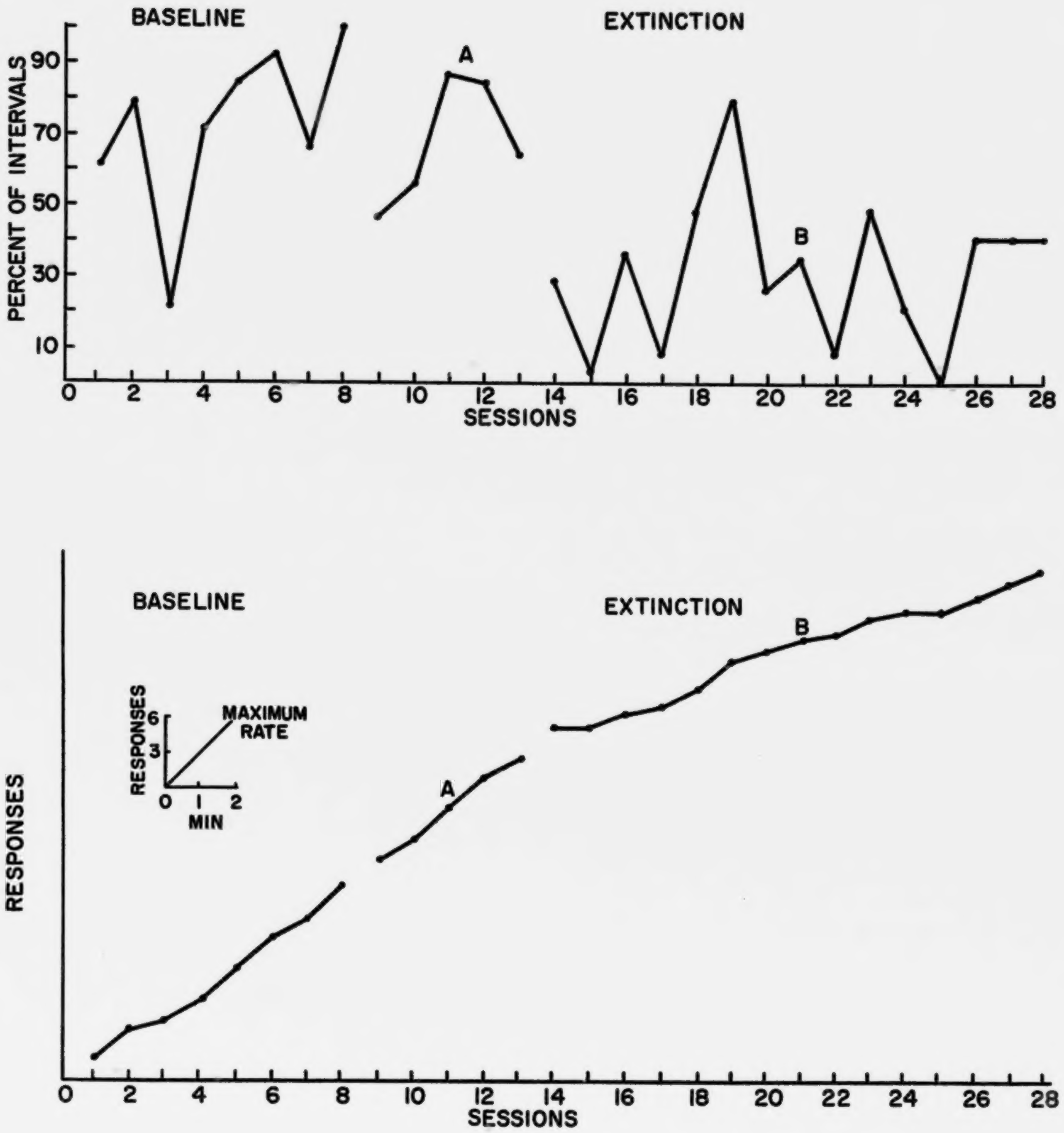
BASELINE
EXTINCTION
A
B
PERCENT OF INTERVALS
90
70
50
30
10
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
SESSIONS
BASELINE
EXTINCTION
B
A
RESPONSES
6
3
0
1
2
MIN
MAXIMUM RATE
RESPONSES
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
SESSIONS

Figure 6

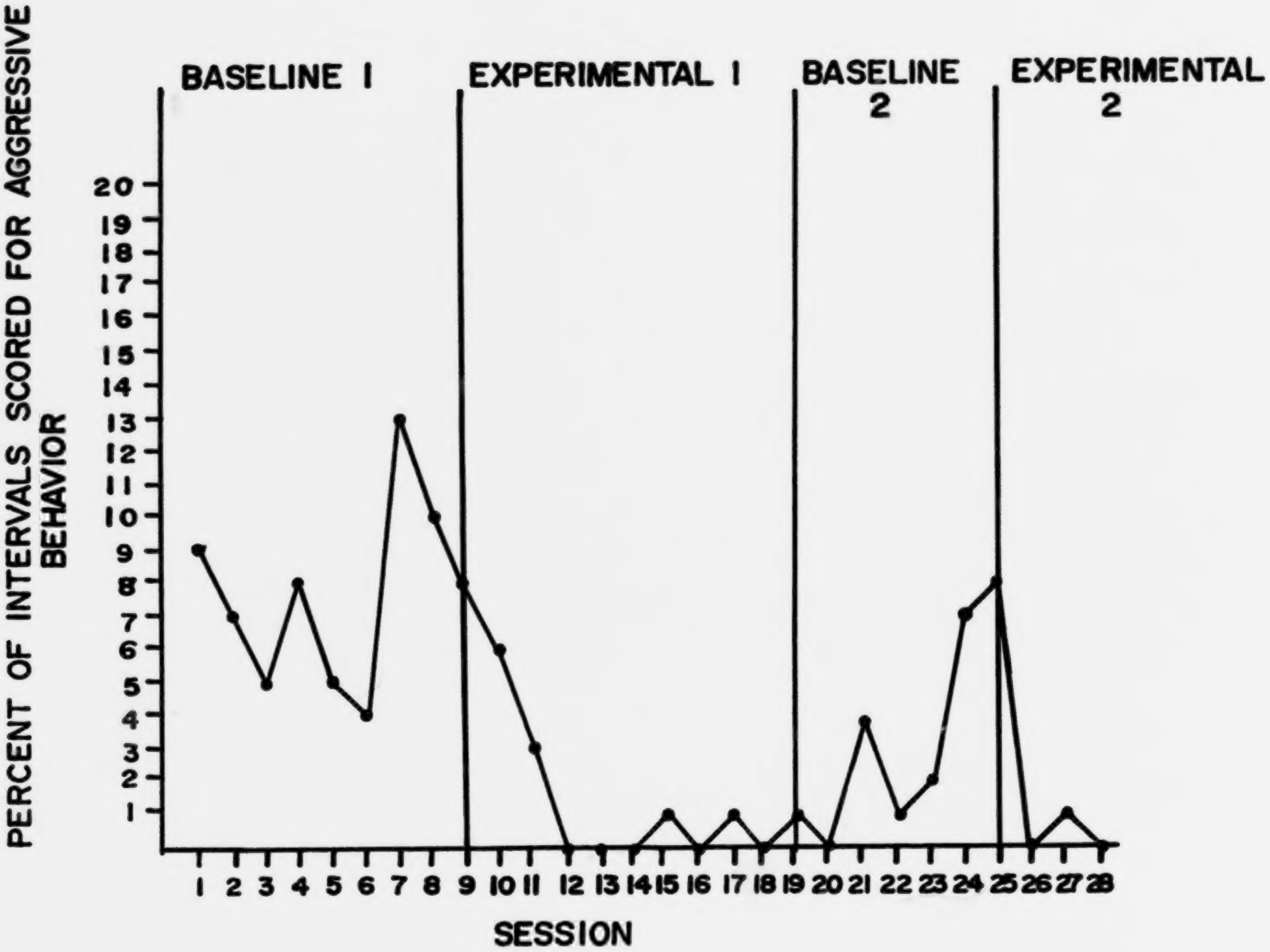
BASELINE 1
EXPERIMENTAL 1
BASELINE 2
EXPERIMENTAL 2
PERCENT OF INTERVALS SCORED FOR AGGRESSIVE BEHAVIOR
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
SESSION

Figure 7

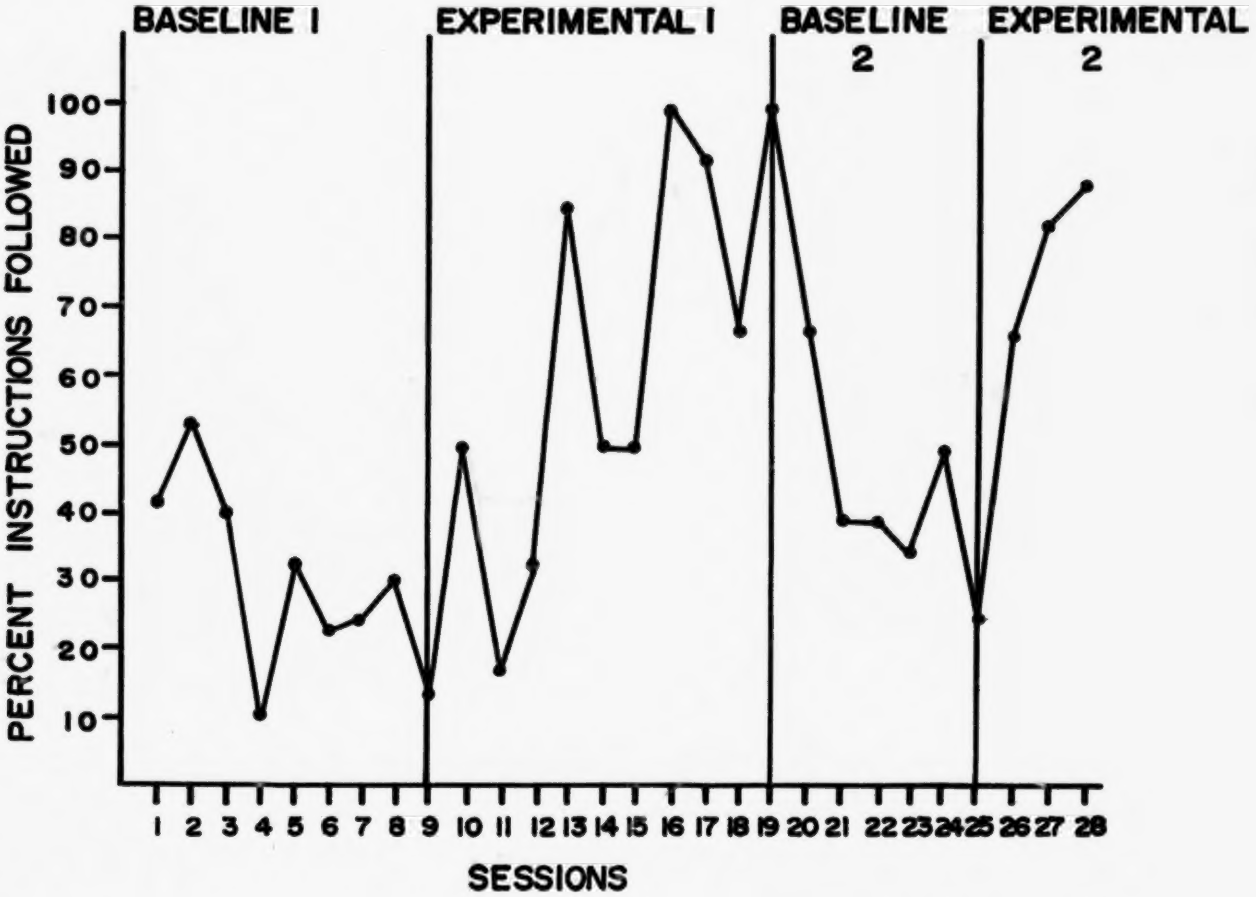
BASELINE 1
EXPERIMENTAL 1
BASELINE 2
EXPERIMENTAL 2
PERCENT INSTRUCTIONS FOLLOWED
100
90
80
70
60
50
40
30
20
10
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
SESSIONS

Figure 8

OE 6000 (REV. 9-66)

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TITLE

Research in Remedial Guidance of Young Retarded Children with Behavior Problems which Interfere with Academic Learning and Adjustment. (Research in the Preschool Education of Retarded Children with Behavior Problems: Application of Behavioral Principles to a Program in Prevention) Final Report.

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children, social reinforcement, classroom, preschool, non-contingent reinforcement, behavior modification, operant conditioning, programmed learning, reading, writing, arithmetic, extinction, tokens, academics, teacher attention, education, study behavior, obedience, behavior principles, parent counseling, mental retardation, behavior problems, teaching training, autism, speech, drooling, tantrums, aggression, shyness, functional analyses, contingency management, aversive stimulation, time-out, Down's Syndrome,

IDENTIFIERS parent training, eating problems, fantasy play, discrimination.

ABSTRACT

This report describes a four-year research program whose objectives were to develop a preschool program for exceptional children based on empirical behavioral principles. The program attempted to arrest retardation and emotional problems in children unable to attend public school but not sufficiently deviant to require institutionalization.

The report describes the physical plant, curriculum, and operation of the school. It specifies how behavioral principles were applied to (1) weaken behaviors interfering with academic learning, and (2) to strengthen desirable social and intellectual behaviors. The reading, writing, and arithmetic programs developed are discussed as well as procedures for maintaining motivation for learning. The report also discusses the application of behavioral techniques in modifying the aggressive, shy, and speech deficient child.

Since the modification of such problems can often involve work with parents, ways in which the parent can support or supplement the nursery school program are also considered, along with the results of several investigations.

Finally an account is given of the use of behavioral principles in the training of teachers. This account suggests the terminal behavior for the teacher and describes procedures and steps toward achieving teaching skill.